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MEDICAL NEWS LETTER

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Policy

The U.S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

Change of Address

Please forward changes of address for the News Letter to: Commanding Officer, U.S. Naval Medical School, National Naval Medical Center, Bethesda, Maryland 20014, giving full name, rank, corps, and old and new addresses.

FRONT COVER: U.S. Naval Hospital, Key West, Florida. The first naval hospital at Key West, was the remodeled Hargrove Seminary purchased from a religious organization and commissioned in 1918 with a capacity of 150 beds. This hospital, occupying the block enclosed by White, Florida, United and Seminary Streets, was used until June 1926 when it was decommissioned. Reactivation of this hospital was considered prior to the onset of World War II with the increase in naval activities in the Key West area. The buildings, which were being used by the Works Progress Administration and the State Health Clinic, were inspected in February 1941 but were found not suitable for renovation and remodeling into a modern hospital.

A site for the construction of a new naval hospital was selected at the eastern end of Key West island. Funds amounting to $800,000 for the construction of the hospital were provided by the Second Deficiency Appropriation Act 1941, approved on 3 July 1941. The Secretary of the Navy approved the site selected at the eastern end of the island.

A contract for the architectural plans of the hospital was issued to Harold D. Steward on 21 August 1941 and the hospital was commissioned on 15 October 1942, CAPT J. W. Allen MC USN, in Command.

During 1943 the bed capacity of the hospital was increased by the addition of four-single story concrete-block ward buildings erected in the rear of the main structure.

Presently the facility consists of 34 buildings, 18 permanent and 16 of temporary construction. Total acreage is 14.65.

The issuance of this publication approved by the Secretary of the Navy on 4 May 1964.

FEATURE ARTICLE

BUFFERED SALINE IN BURNS AND HEMORRHAGIC SHOCK

*By Benjamin F. Rush, Jr. M.D.**

In the light of recent clinical and laboratory observations, saline solutions promise the ability to substitute for the majority of colloid solutions used for the resuscitation of patients in hemorrhagic and burn shock. If this promise is fulfilled, the logistics of supplying colloidal solutions, especially blood, to men in the field will be greatly simplified. During the Korean War, 20 per cent of the wounded received transfusions and each transfused soldier received an average of 4.3 units of whole blood.[12] The procurement, shipment, storage and administration of enormous amounts of this perishable fluid presents severe supply problems and is accompanied by considerable waste. The use of dextran and plasma is not so complex but still more expensive than saline solutions.

Saline and Hemorrhagic Shock

Until recently it was accepted clinically that saline solutions were not an important part of the regimen for the treatment of hemorrhagic shock. These solutions were thought to have the following deficiencies: They rapidly left the vascular compartment; when compared unit for unit with whole blood the effects of saline solutions were transient at best; the post-trauma patient retained water and saline so that infused saline was not excreted and was poorly tolerated, leading to overhydration and edema. New clinical and experimental data has produced a revolution in the attitude to saline solutions. Wolfman[14] emphasized the current change in thinking by noting that a manuscript by Coller and co-workers in 1944 was entitled "Postoperative Salt Intolerance," while a paper by Shires and Jackson in 1962 bore the title "Postoperative Salt Tolerance."

Sayers, Sayers and Long,[9] experimenting with rats, made the important observation in 1946 that saline solutions were just as effective as blood in treating hemorrhagic shock if three to four times the volume of blood lost was given. Metabolic studies in postoperative patients by Randall and Papper[5] indicated a decrease in extracellular fluid volume. Measurement of extracellular fluid volume with radiosulfate by Shires confirmed a major decrease in extracellular volume associated with operative and hemorrhagic shock.[10,11,12] Experiments in dogs and rats indicated that buffered saline solutions were just as effective, perhaps better than blood transfusions, in treating shock, providing enough solution was given.[7,12,15] Clinical reports of the use of buffered saline in shock have also been encouraging.[1,10] Shire's practice is to give 1,000 to 2,000 cc of buffered saline to patients admitted to the emergency room in shock before giving any blood. He notes that if the extracellular fluid deficit is repaired that often little or no additional blood is required.[10]

Saline and Burns

For the past 20 years the fluid therapy for burns was dominated by "Burn Formulae." These rules of thumb have required that up to 50 per cent of the fluids given be composed of colloid solutions, either blood or plasma. Despite this, a small body of clinical and experimental evidence has accumulated indicating that fluid replacement with buffered saline solutions alone is equally adequate or perhaps better treatment.

As early as 1943 Rosenthal[6] standardized burn shock in mice and noted that 15 per cent of body weight of isotonic sodium solution brought about survival in 92 per cent of 916 mice. In 1954, Rosenthal and Millican's definitive review of the problem of electrolyte replacement in traumatic shock stimulated Markley and co-workers[3] to use saline solutions alone compared with plasma plus dextrose in a controlled study conducted in Peru. There was no early mortality in the saline group. In the plasma and dextrose group the early mortality was 12 per

* From the Dept of Surgery, University of Kentucky Medical Center, Lexington, Kentucky. Supported in part by NIH Grant No. AM-06956-04, and by OSG Research Contract NO. DA-49-193-MD-2348.

cent. In children the use of plasma plus saline appeared superior to saline alone. Fox and others[2] observed that patients treated with saline solutions alone did as well as patients treated with saline plus colloids. Wilson and Stirman[14] found survival rates were better in burned patients if all colloids were omitted in therapy and only saline solutions administered.

Reason for Effectiveness of Saline Solutions

The documentation of diminished extracellular fluid volume in shock of diverse etiologies has served to clarify further our concepts of the normal progression of the shock state. In burns, tourniquet shock, crushing injuries and operative trauma, fluid is lost from the extracellular space into the area of trauma. This is a long-recognized phenomenon labeled the "third space" by Randall. The recognition of a loss of extracellular fluid in hemorrhagic shock without accompanying tissue, trauma indicates that a "third space" exists in the cells of the body generally when they are injured by progressive ischemia. The site of loss of extracellular fluid is not definitely identified, but is assumed to be a shift into the intracellular space. This response in tissues is probably nonspecific, since Rush and Randall[8] found a similar loss of extracellular fluid in acute uremia with a movement of sodium and water into cells.

Fluids in the vascular compartment are a part of the general extracellular compartment and as this compartment decreases intravascular volume diminishes also with decrease of cardiac output, fall in blood pressure and a rise in hemoglobin and protein concentration if no blood is lost. When shock of this nature is treated with blood transfusions, the red cell mass given is useless to the patient and the fluids present in a transfusion are inadequate to replace the extracellular loss. Blood pressure may rise initially with transfusions, but the extracellular space remains depleted. Administration of a balanced salt solution in large volumes will replace this deficit in extracellular fluid. Normal saline alone is a poor replacement, since it leads to dilutional acidosis. Saline buffered with bicarbonate more closely resembles the extracellular fluid being replaced.

Moyer[4] and Rosenthal et al[7] have suggested that the important component in buffered saline solution therapy in shock is the sodium ion, and feel that it is the depletion of sodium mass which leads to the shock state.

Current Status

Enough clinical evidence is at hand to justify the use of buffered saline solutions alone in the treatment of burn shock. Ringer's lactate or Hartman's solution is used. Adequate replacement is indicated by the maintenance of an hourly urine output of 40-50 cc. Evidence of overhydration is continually observed by monitoring venous pressure. The use of buffered saline solutions as the main solution in the resuscitation of patients in hemorrhagic or traumatic shock is still being evaluated and should not be generally adopted as yet. However, if a patient in shock fails to respond to the administration of blood and plasma, Ringer's lactate solution should be added to the regimen.

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SPECIAL ARTICLE

MEDICINE IN ANTARCTICA

The continent of Antarctica comprises 6,000,000 square miles of the most beautiful, yet frightening geography in the world. Majestic mountains, including one live volcano, raise their heads above miles of untracked snow fields; comical penguins strut and peer at the strange humans who have invaded their domain; skua birds circle the penguin rookeries in search of unguarded eggs, and the Weddell seals bask in the sun. Throughout this vast scene of contrasts an unpenetrable sense of quietness prevails. The occasional sound of a tractor or aircraft interrupts this feeling, but in a matter of moments is gone and forgotten. Antarctic research stations are small oases in this vast land, a tribute to man's ability to exist in spite of his environment.

With the commencement of the International Geophysical Year in 1956, the United States has undertaken a vast program of research on the Antarctic continent. The National Science Foundation, by direction of the President, has the responsibility for planning, coordinating, managing and funding the Antarctic Research Program. The Department of Defense, also by direction of the President, is charged with planning and carrying out the operations in support of the scientific and other programs in Antarctica. The task of the logistic support of this gigantic undertaking was given to the U.S. Navy, with the responsibility for these support duties being assigned to Commander, U.S. Naval Support Force, Antarctica (Task Force FORTY-THREE). In carrying out these responsibilities for the required transportation, cargo shipment, construction and maintenance of facilities, housekeeping and communications the Commander calls upon the Coast Guard, Air Force, Military Sea Transportation Service, Military Air Transport Service, and the Army, in addition to his own forces.

Presently, programs in the fields of Biology, Geology, Glaciology, Meteorology, oceanography, terrestrial physics, and upper atmosphere physics are being sponsored by the National Science Foundation. In supporting these programs, the U.S. Navy presently operates six stations on the Antarctic continent. Five of these stations are maintained the year around, while one station is operated only during the summer months. At all of these stations, the Navy Medical Department is represented by a carefully selected group of personnel. At some of the stations, the Medical Officer is also the Officer in Charge of the station, thus giving to him the unique opportunity of acquiring command responsibilities early in his career. During the long winter months of complete isolation when the only contact with the outside world is via radio communication, the total responsibility for safety and maintenance of the station plus the safety and welfare of the personnel rests solely upon his leadership and ability to assume command of the situation. These responsibilities bring out the best in men and are much sought after by personnel of Operation DEEP FREEZE.

Of all Antarctic stations, McMurdo station, on the edge of the Ross Ice Shelf is the largest. Here is the staging area for men and supplies to penetrate the inland resources of the continent. The medical department at McMurdo is housed in a new, completely equipped dispensary, with every facility necessary for the adequate care of the approximately 1,000 personnel who are stationed there during the summer operating season. At McMurdo station there is one Flight Surgeon and four Hospital Corpsmen, one HMC, one HM1 and two HM2s. Additionally there is a modern dental operating room staffed by one dental officer and one dental technician during the winter, with an additional technician during the summer. The dispensary has an operating room, laboratory, pharmacy, X-ray and physio-therapy department. The ward has four beds and there are two quiet rooms for the care of contagious or critically ill patients.

The dispensary here is a contrast from those at Pole, Byrd, Hallett, Plateau, and Palmer stations where the medical department has small spaces in conjunction with administrative departments. Restricted though they may be, the medical departments

at these smaller, inland stations are remarkably complete in their ability to provide medical treatment to station personnel. Laboratory, X-ray, Pharmacy and physio-therapy facilities are available when necessary, although the high degree of physical conditioning of personnel assigned to these stations limits the necessity for any other than routine and emergency medical care. Medical research is conducted at each station into the problems of cold weather medicine. While each medical officer is encouraged to do independent research projects, they are responsible for research tasks under a broad program sponsored by the Research Division, Bureau of Medicine and Surgery.

In closing, suffice it to say that there has never been a man to go to the Antarctic who did not return a better, more rounded and more experienced person. The opportunities to form strong friendships, broaden one's knowledge and aid in the acquisition of information of the world in which we live have never been more attainable than they are to those who follow the footsteps of Scott, Shackleton, and Admiral Byrd in the "Last Frontier" on earth. —LCDR P.E. Tyler MC USN.

MEDICAL ARTICLE

FATAL RADIATION SYNDROME FROM AN ACCIDENTAL NUCLEAR EXCURSION*

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New England J Med 272(15): 755–761, April 15, 1965.

The acute radiation syndrome will almost surely be encountered from time to time as accidents occur in the rapidly expanding nuclear-energy industry. Nuclear power is already becoming economically competitive with conventional sources.[1] In view of the present magnitude of these activities it is remarkable that there have been so few accidents already, a testament to the care that has been exercised in safety control of highly hazardous undertakings during the past twenty years or so.

The first fatal accidental nuclear excursions occurred in 1945 and 1946 at Los Alamos.[2] One of the victims died nine days, and the other twenty-four days after exposure. The whole-body dosages were estimated respectively to be 1350 and in excess of 297 rads.[3] The next accident occured at the Boris Kidric Institute at Vinca, Yugoslavia.[4,5] Six men were exposed, and 1 died. All these men received bone-marrow transplants in the fifth week,[6] but it is not entirely clear just what this contributed to the recovery of the surviving subjects. The patient who died received an estimated 640 rads of whole-body radiation, and the rest less than 600.[3] The most recent and perhaps most thoroughly studied accident was at Los Alamos in 1958, when an operator received an estimated total dose of 3900 to 4900 rads and died thirty-four and three-quarters hours later.[7] All these accidents have resulted from attainment through error of a critical mass and a resulting nuclear chain reaction. When fissionable substances, such as an isotope of uranium (U^{235}), become confined in a sufficient mass and appropriate environment so that their fast neutrons are slowed to the point where their capture by fissionable atoms becomes significantly probable, a vicious circle of fission by capture and further release of neutrons is set in motion. This is a nuclear chain reaction. Some of these lethal or near lethal accidents have caused a single burst of neutrons lasting only a few microseconds; others may have involved resurgent bursts as the responsible solution has boiled up and receded only to reach its critical mass again.

The present account concerns a fatal accident in a U^{235} recovery plant. The patient was cared for in a large general hospital by a staff that had had no previous experience with a similar problem. The patient survived for forty-nine hours after receiving ten to twenty times a lethal radiation exposure. He probably received the heaviest radiation dose of any victim of a nuclear accident, and this was the first

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fatality in private industry. Many medical and administrative difficulties were faced, and similar ones will be encountered at the time of any similar accident in the future.

Case Report

Late in the afternoon of July 24, 1964, a 38-year-old married father of 9 was pouring a "dirty" mixture containing U^{235} from a polyethylene cylinder 12.5 cm in diameter and 120 cm high into a tank 63 cm in diameter containing sodium carbonate. A critical volume was attained by the new geometry near the completion of this operation, and a nuclear excursion occurred. The patient recalled a flash of light and was hurled backward and stunned, but did not lose consciousness. He immediately ran from the building to an emergency shack 200 yards away, discarding his clothing as he ran. There he was joined by 4 other occupants of the plant who had been alerted by the radiation alarm system. Almost at once the patient complained of abdominal cramps and headache, vomited, and was incontinent of diarrheal stool, which according to his colleagues was bloody. He was wrapped in warm blankets and taken to a nearby hospital (but not admitted) and transferred at once to the Rhode Island Hospital. He arrived at 7:49 p.m., 1 hour and 43 minutes after the accident.

He was taken at once to an isolated section of the emergency receiving service. He was complaining of severe abdominal cramps, headache, thirst and chilliness, and was perspiring profusely. He was incontinent of brownish but nonbloody diarrheal stool. Physical development and nourishment appeared excellent. The blood pressure was 160/80, the pulse, 100 and regular, the respirations 20, and the temperature 100.4°F. Skin color and turgor were normal. The pupils were round, regular, and equal, and reacted to light and in accommodation. The optic fundi appeared normal. The patient had transient difficulty in enunciating words. The neck was supple, and the lungs were clear to auscultation. The heart was not enlarged, there were no murmurs, and the quality of the sounds was good. The abdomen was rigid. No masses were palpable. Muscle tone was normal, and peripheral pulses were full. There was no edema. The reflexes were intact.

After a brief initial examination 100 mg of diphenhydramine was given intramuscularly, and 12 mg of morphine subcutaneously. Because of continued restlessness 15 mg of morphine was administered again 1 hour after the initial dose, and a good effect was obtained. A review of medications appears in Table 1. Blood samples were immediately drawn for routine studies and for chemical and radiation analyses.

A cannula was placed in a vein in the left ankle, and plasma was started. Because of vomiting and abdominal distress Levin tube was inserted, but aspiration revealed only gastric juice without blood. A Foley catheter was then passed to monitor accu-

TABLE 1. *Summary of the Therapeutic Agents Employed in the Symptomatic Treatment of the Patient.*

COMPOUND	DOSE	DOSES ADMINISTERED	RATIONALE	EFFICACY
Diphenhydramine	100.0 mg.	2	Intestinal hypermobility & vomiting	Good
Morphine	12.0 mg.	8	Pain & irritability	Good
Chloramphenicol	2.0 gm.	4	Antibiotic prophylaxis (?)	? Effectiveness
Neomycin	1.0 gm.	11	Sterilization of intestinal tract	? Effectiveness
Methylprednisolone	40.0 mg.	6	Adrenocortical failure (?)	Some value
Dimenhydrinate	50.0 mg.	2	Intestinal hypermobility & vomiting	Good
Levarterenol	8.0-12.0 mg.	9	Hypotension	Helpful
Metaraminol	200.0 mg.	1	Hypotension	No value
Mannitol	12.5 gm.	2	Osmotic diuretic	No effect
Hypertensinogen	5.0 microgm.	1	Hypotension	Unknown (patient died)

rately the urinary output. Neomycin, 1 gm was given every 4 hours through the Levin tube, and 2 gm of chloramphenicol was begun intravenously with dextrose and saline solution in an endeavor to prevent infection if the patient survived long enough for effects of bonemarrow deprivation to become apparent. By 2 hours after admission the blood pressure had fallen to 130/60, and the pulse had risen to 90. Vomiting and diarrhea had ceased.

By 4 hours the blood pressure had dropped to 85/40, and the pulse had risen to 110. Methylprednisolone (40 mg) was added to the intravenous infusion, and the systolic blood pressure rose to 100. Levarterenol, 8 mg, was begun at this time along with methylprednisolone intravenously to maintain the systolic blood pressure between 95 and 100. By 8 to 10 hours after admission the patient reported that he felt well. There was no other evidence of adrenal failure. The temperature had risen to 102° F. The left hand and forearm, which had held the container, and were nearest the reaction, became edematous and red. Conjunctivitis and periorbital edema appeared on the left. He was alert and cooperative, and spent the time reading and talking. Visual acuity for newsprint seemed normal.

X-ray study of the chest approximately 16 hours after the accident suggested some hilar congestion (Fig. 1), but the lungs remained free of rales, and he was not dyspneic. The hand and forearm became painful, and pain from venospasm of the leg caused by the infusion of levarterenol became severe and continued to be a troublesome symptom. The flow of urine diminished.

The patient was quite comfortable but slightly restless on the morning after exposure. The edema of the hand and forearm was increasing, and the fingers were moved with difficulty (Fig. 2). The neck veins were not distended. The respirations were 24 to 28. The blood pressure was maintained with norepinephrine, and this constituted a major therapeutic problem throughout the remainder of the course. A trial of metaraminol failed, as did hypertensinogen, but the latter was only used preterminally.

The condition of the patient had deteriorated by the morning of the 2d day. He was restless, fatigued and apprehensive and had become more dyspneic. The left hand and forearm were badly swollen and livid, and there was massive edema of the upper arm. The conjunctivitis and blush of the left side of the face had increased. The lungs were free of rales. Vision had diminished to a point where he was unable to read 1-inch type, but he could still distinguish faces.

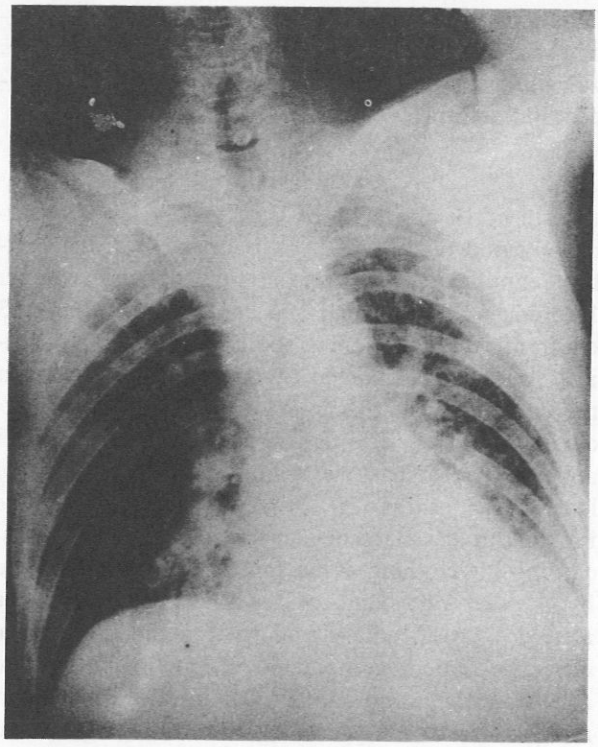

FIGURE 1. *X-Ray Film of the Chest Taken with a Portable Apparatus Sixteen Hours after the Accident.*

From this point the blood pressure could be maintained only with increasing difficulty. The heart increased in rate, and the sounds became tic-tac in quality. Six hours before death the patient became extremely restless and disoriented, the urinary output ceased, and the blood pressure could no longer be obtained. He died 49 hours after the accident.

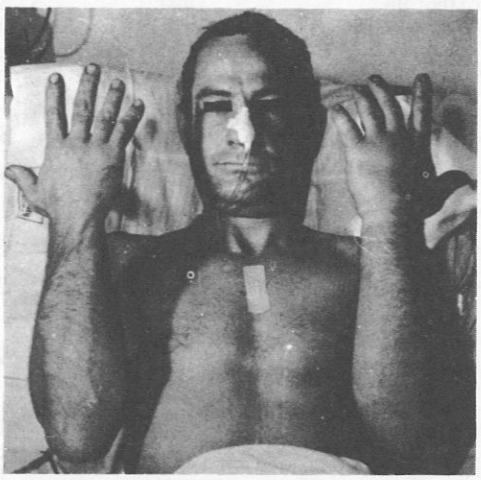

FIGURE 2. *Appearance of the Patient Approximately Twenty-four Hours after the Accident, Showing the Edematous Left Hand and Arm.*

A detailed account of the pathological findings on postmortem examination will be published separately. The following summary was prepared by Dr. Herbert Fanger, pathologist to the Rhode Island Hospital:

There was interstitial edema of the subcutaneous tissues of the left forearm, hand, anterior abdominal wall and chest wall. The trachea and esophagus were acutely inflamed. There was bilateral hydrothorax and slight hydropericardium and ascites. The lungs showed interstitial and intra-alveolar edema, and there was subserosal edema of the stomach and intestines and severe submucosal edema of the transverse and descending colon.

Acute pericarditis involved chiefly the anterior right atrium and the adjacent upper right ventricle. Interstitial myocarditis and periaortitis of the ascending aorta were also present.

The liver showed passive congestion and focal fatty metamorphosis, and there was acute pancreatitis, with patchy necrosis of the acini and infiltration by polymorphonuclear neutrophils.

The spleen, lymph nodes, thymus and intestinal tract were depleted of lymphocytes, but the reticulum cells of the follicles were retained. The bone marrow was aplastic. Only a few cells of the hematopoietic system remained.

The brain showed minimal changes. Rare foci of microglial proliferation were found, and a few oligodendroglia were swollen.

There was interstitial edema in the testes and rare necrosis of spermatogonia.

A radioautograph of the skin of the left hand disclosed the presence of radiation-emitting substance in the keratin layer suggestive of ray contamination.

The principal blood chemical measurements appear in Table 2. There was a gradual rise in blood urea nitrogen and creatinine concentrations. The uric acid concentration was elevated within 3 hours of exposure, at a time when the blood urea nitrogen concentration was normal, and remained at a high level throughout. Plasma electrolytes were normal except for a single elevation of chloride. The carbon dioxide content was reduced, but it is not known whether this was due to respiratory alkalosis or metabolic acidosis.

There was minimal evidence of liver damage. The serum glutamic oxalacetic transaminase activity rose from a normal value of 13 units at 2 hours to a borderline value of 40 units at 15 hours and a final value of 50 units at 44 hours. Serum bilirubin concentrations, thymol turbidity and alkaline phosphatase were within normal limits. Prothrombin activity was 50 per cent of normal at 15 hours and 47 per cent at 44 hours. No abnormality of the serum proteins was detected.

The hematologic findings in the peripheral blood are listed in Table 3. There was a moderate trend toward hemoconcentration as the illness progressed. The total white-cell count of peripheral blood was elevated at the initial examination at 2 hours, and increased to 46,000 cells per cubic millimeter at 38 hours. Lymphocytes constituted 5 per cent of the white cells at 2 hours and 1 per cent at 15 hours, and were not seen in subsequent blood smears. These findings are shown graphically in Figure 3. There were no noteworthy changes in the platelets.

The bone marrow was examined twice. The 1st aspiration was from the sternum at 4 hours, and the 2d from the ileum at 40 hours. The results appear in Table 4. The findings in the 1st aspiration were virtually normal, and a normal complement of lymphocytes was seen. There seemed to be a tendency to a shift toward maturity of the erythroid elements, and a few unidentified cells with irregular pink-stained granules and pyknotic nuclei were found. The specimen at 40 hours was entirely different. The aspirate was fluid. Almost all the cells were mature granulocytes with "toxic" granules, and some of these were in various stages of disruption. The megakaryocytes had disappeared.

TABLE 2. *Changes in Serum Constituents after Acute Gamma-Neutron Exposure.*

Interval after Exposure	Blood Urea Nitrogen	Creatinine	Uric Acid	Sodium	Potassium	Carbon Dioxide	Chloride
hr.	*mg./100 ml.*	*mg./100 ml.*	*mg./100 ml.*	*milliequiv./liter*	*milliequiv./liter*	*milliequiv./liter*	*milliequiv./liter*
Normal value	0-17	1.0-2.0	3.5-5.0	135-145	3.5-5.0	26-28	100-106
3	18	1.3	9.3	140	3.7	21	104
15	37	2.0	16.9	148	4.3	17	121
27	45	—	16.4	—	—	—	—
44	59	2.7	15.5	136	4.7	13	105

TABLE 3. *Changes in Hematologic Findings after Acute Gamma-Neutron Exposure.*

Interval after Exposure	Hemoglobin	Hematocrit	White-Cell Count	Differential Count			Platelets	Total Eosinophil Count	Reticulocyte Count
				Neutrophils	Lymphocytes	Monocytes			
hr.	*gm./100 ml.*	*%*		*%*	*%*	*%*		*%*	*%*
2	15.5	43.5	17,750	95	5	—	188,000		
15	12.9	37.0	20,150	95	1	4	155,000		
21	13.7	38.5	28,800	100	0	0	175,000	5	0.4
27	16.3	47.0	36,000	100	0	0	220,000		0.3
38	17.5	51.5	46,000	100	0	0	170,000		

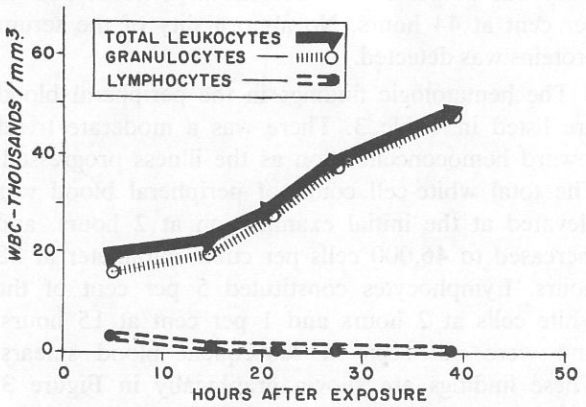

FIGURE 3. *Leukocyte Changes in the Peripheral Blood after Exposure*

Three electocardiograms were obtained. These appear in Figure 4. The 1st, taken at 22 hours, was within normal limits. The axis was +30. There was a suggestion of peaking of the P waves in the diaphragmatic leads. The 2d, taken at 39 hours, showed persistently prominent P waves, diminished QRS voltage, lowered T waves and a shift in the QRS axis toward the right to +55°. There was slightly more clockwise rotation in the precordial leads. The final tracing, taken at 44 hours, showed still further diminution in the QRS voltage and lowering of the T waves. The changes seemed consistent with some degree of progressive actue strain of the right side of the heart and correlated with the dyspnea and pulmonary congestion and edema exhibited by the patient. Since there was no significant pericardial collection at autopsy the lowered QRS voltage may have been due to acute hyperinjection of the lungs produced by the pulmonary congestion. It is not clear how much of this may be attributed to radiation-induced changes in the pulmonary circulation, radiation damage to the heart and circulatory overload from intravenous therapy. The last was probably not a prominent factor since most of the fluid intake was accounted for by output plus a reasonable allowance for insensible water loss, and there was also hemoconcentration rather than hemodilution. The fluid balance appears in Table 5.

Radiation Considerations

Shortly after admission to the hospital a survey of the body surface was made for gamma emission. The reading at 2 feet from the face and upper chest was 40 milliroentgens per hour, 18 milliroentgens per hour at the same distance above the mid-portion of the body, and 10 milliroentgens per hour above the feet. Shortly thereafter the patient was given a thorough bath on a plastic sheet, and this materially reduced the readings. Measurements were repeated immediately after death and disclosed the following, in milliroentgens per hour: head, 7.5; face, 3.5; chest, 2.5; abdomen, 5.0; right arm, 2.5; pubis, 4.0;

TABLE 4. *Bone-Marrow Differential Count.*

Differential	Normal Range %	4 Hr. after Exposure %	40 Hr. after Exposure %
Polymorphonuclears	10-35	7.5	91.5
Bands	10-20	36.5	8.5
Metamyelocytes	2-15	19.5	
Myelocytes	2-15	10.0	
Promyelocytes	0-5	1.5	
Basophils	0-3	0.5	
Eosinophils	0-7	7.0	
Lymphocytes	5-20	12.0	
Monocytes	1-7		
Reticulum cells	1-5		
Primitives	0-4		
Blasts	0-5		
Plasma cells	0-5	5.5	
Clasmatocytes	0-1		
Normoblasts	0-5	0.5	
Late erythroblasts	5-30	11.0	
Early erythroblasts	1-15	17.0	0.5
Proerythroblasts	0-1		

thigh, 2.5; and feet, 1.1. Thus, at the time of death an attendant could have worked within 2 feet of the patient's head for nine hours to have received the maximum allowable radiation exposure for one week. This estimation, of course, does not take account of possible crosscontamination from alpha-emitting and beta-emitting isotopes on the skin and hair or in the excreta, which was clearly the significant hazard.

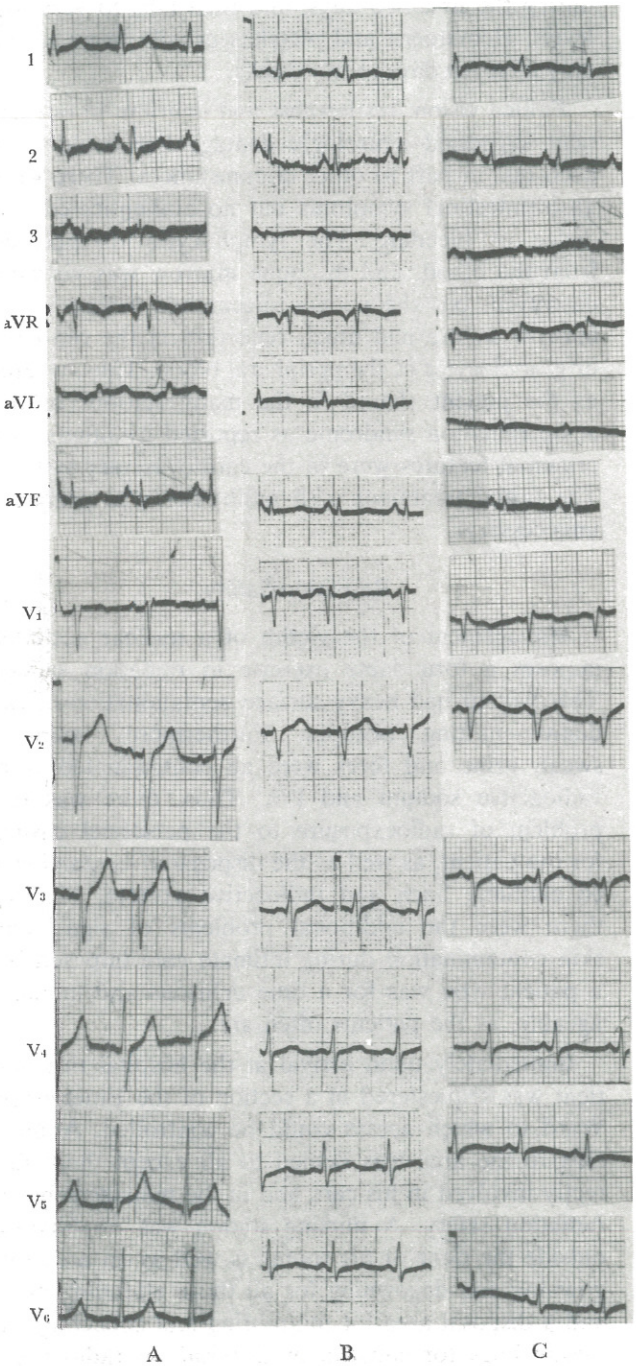

FIGURE 4. *Serial Electrocardiograms Taken Twenty-two Hours* (A), *Thirty-nine Hours* (B) *and Forty-four Hours* (C) *after the Accident.*

Samples of blood, urine, feces and hair and a gold ring were studied in the Physics Research and Thyroid Research Laboratories of the Massachusetts General Hospital. All samples were measured with an NaI (T1) well detector and a 512-channel gamma-ray spectrometer. The spectrums from the blood, urine, feces and vomitus corresponded exactly to Na^{24} in that the primary peak was at 1.37 MeV, and conformed exactly to an authentic sample of Na^{24}. The spectrum from the hair was much more complex and indicated contamination with several fission products. The gold ring yielded a spectrum characteristic of Au^{198} and no evidence of other activation products.

A comparison of the Na^{24} content of the plasma sample at sixteen and a half hours and authentic Na^{24} standards was made by integration of the total counts in the 120 channels that included both the gamma peaks. Background was subtracted, and sufficient counts accumulated to give 1 per cent counting statistics. The result was extrapolated to the time of the accident and indicated a plasma assay of 0.0264 microcurie per milliliter. A plasma sample drawn at seven hours was analyzed similarly and showed good agreement.

Precise calculation of the radiation dose received by the patient would depend on exact knowledge of the geometry of the accident and of the neutron and especially the gamma-ray spectrum resulting from the excursion. Also, one would need to know the ratio of gamma rays to neutrons. If one assumes that this accident was similar to the Y-12 accident at Los Alamos[8] it can be estimated from the Na^{24} content of the plasma that the patient received a neutron dose of approximately 2200 rads and a gamma-

TABLE 5. *Fluid Balance.*

DATE	INTAKE *ml.*		OUTPUT *ml.*	
7/24/64 (8 p.m.)	2825	(clear)	1385	(urine)
7/26/64 (8 a.m.)	1750	(plasma)	2015	(Levin tube & vomitus)
	4575		3400	
7/26/64 (8 a.m.)	2000	(clear)	65	(urine 0 last 7 hr.)
7/26/64 (7 p.m.)	500	(plasma)	400	(Levin tube)
			325	(vomitus)
	2500		790	
Totals	7075		4190	

ray dose of 6600 rads, or a total whole-body dose of 8800 rads. This is probably between ten and twenty times the average lethal dose.

Specimens of urine, feces and vomitus were thinly dried on planchettes and counted in a high-efficiency, very-low-background gas-flow, beta counter after time had elapsed for complete disappearance of the short-lived Na^{24}. Counting efficiencies were corrected by measurement of an authentic standard of P^{32}. Serial counts were made over a three-week period, and the resulting curves fitted by eye. The decay constants were consistent in each count with the presence only of P^{32}. The P^{32} concentration of the four-hour urine sample was calculated to be 0.0062 microcurie per milliliter.

The Medical Problem

It is apparent from the estimation of the dose of radiation received by this patient that no known form of therapy would have been effective in saving his life. The central problem was failure of the circulation. Not only was there failure to maintain an adequate blood pressure, and unsustained response to vasopressor agents, but also there was evidence of dilatation of the right side of the heart and venous congestion. This aspect of the acute radiation syndrome has been encountered before and seems to have received little consideration.[9] It might be suggested that circulatory failure is due to vasoactive peptides released as a result of radiation-induced cell distribution. At all events cell destruction was indicated by the findings in the bone marrow and the rise in uric acid and transaminase in the blood. The possibility that the shock was neurogenic in origin cannot be excluded.

There have been virtually no studies on the acute radiation syndrome in man except for the exhaustive observations on the victims of the Los Alamos,[2] Vinco[4,6] and Oak Ridge accidents.[8,10,11] Countless studies have been made on the effects of radiation exposure of laboratory animals. The lethal radiation syndrome has been somewhat arbitrarily divided into the neurologic, gastrointestinal and hematologic forms. Beginning almost immediately after exposure, the patient may be disoriented, ataxic and delirious. This state usually clears within a few hours or days. Delirium and mania may occupy the last few hours or days before death. The shocklike state that may be seen immediately after exposure and may persist until death may have a neurogenic basis, but this is not clear. Initially, the gastrointestinal findings range from nausea to vomiting, cramps, and explosive diarrhea, the last being an ominous sign. Gastrointestinal bleeding has not been prominent. If these symptoms clear abdominal discomfort and anorexia may take their place and persist for weeks. Ulcerations of the oral mucosa may be troublesome. As in the case reported above, the lymphocytes disappear from the blood of the heavily irradiated patient within a few hours, and the bone marrow becomes aplastic within a day or two. The neutrophil count in the peripheral blood may rise to 15,000 to 50,000 during the first two days, and then falls to very low levels. Hematocrit and platelets usually begin to fall only after ten days to two weeks.

Failing vision, restlessness and delirium in our patient suggested neurologic damage but could have been due in part to other circumstances. There were gastrointestinal symptoms but no authenticated evidence of bleeding. The lymphocytes disappeared from the blood, and the bone marrow was virtually destroyed, but the patient succumbed before bone-marrow failure had much reflection in the red cells or granulocytes of the peripheral blood. Thus, whereas the patient shared in the manifestations of the acute radiation syndrome as reported by others, the principal features were in the cardiovascular system. The initial treatment with antibiotics was probably unnecessary.

Radiation Safety

Management of the victim of a nuclear accident imposes a formidable exercise in radiation safety. This patient had heavy surface contamination of radiation-emitting isotopes. Furthermore, vomitus, sweat, urine and feces were all contaminated with radioactive sodium and P^{32}. Thus, there was the problem of radioexposure to the personnel caring for the patient, as well as the disposal of contaminated clothing, linen and radioactive excreta. Finally, there were the additional problems of significant skin contamination during intimate care imposed by a patient who was for a time delirious and unmanageable, as the patients often are.

Immediately upon arrival at the hospital this patient was sequestered in a section of the Emergency Ward to which access could be controlled. Admission to the area was denied to all except those directly involved in his care and in the management of radiation safety. A nursing station was established outside the door of his room, as well as an area for gowning and degowning for all those attending him, and a disposal area for monitoring and collecting all plastic bags for subsequent disposal by radiodecay or through routine channels for radioactive waste.

Those attending the patient were required to wear

caps, masks, gowns, plastic gloves and large paper "grocery" sacks tied over the feet. They discarded these into plastic bags upon leaving the area. Radiation safety was supervised by Mr. Ernest Resner, of the New York Operations Office of the Atomic Energy Commission, who arrived a few hours after his office was notified of the accident. The Atomic Energy Commission medical consultant arrived a few hours later. It is worth noting that consultants from the Commission are available at any time in the event of a nuclear accident.

Other Exposed Personnel

Four persons were in the plant at the time of the excursion, but all were on a different floor level and 30 or more feet removed from the accident. The plant manager entered the plant thirty minutes after the accident with the shift supervisor and spent some time assaying the radiation-contamination levels and draining off the tank containing the residual uranium into critically safe containers. They and another employee were found to have been exposed to 30 to 50 rads of whole-body radiation when their film badges were examined on the following day. Apart from some apprehension they were free of symptoms and have remained so.

Several days later the plant manager, the shift supervisor and the third staff member who had appreciable exposure were measured in the whole-body radiation detector at the Massachusetts Institute of Technology by Dr. Constantine Maletskos. There was minimal but detectable Na^{24} in all 3. The gold ring of 1 of them also had Au^{198} contamination. Ten-milliliter samples of urine from the plant manager and shift supervisor were concentrated and dried on planchettes and measured for beta activity for 25 days. The counting rates were low. The samples were corrected for detector sensitivity against an authentic P^{32} sample. The half-life of decay was forty-six days for 1 sample and fifty-five days for the other, but the logarithmic curves may not have been linear. These findings are taken to mean inhalation or ingestion of fission products while they were draining the tank in the heavily contaminated room where the accident occurred.

These 3 exposed persons have been kept under close medical supervision since the accident. No overt evidence of radiation damage has appeared. Hemoglobin and total and differential white-cell counts and platelets have been normal. The plant manager, forty-three years of age, had a serum uric-acid concentration of 7.6 mg per 100 ml 3 days after the accident. It was 9.2 mg 2 days later, 7.3 mg on the following day and 6.4 mg per 100 ml on the next day. The plasma bilirubin was 1.1 mg per 100 ml on initial determination, but subsequent values were normal. Alkaline phosphatase and transaminase assays were normal. The shift supervisor, thirty years of age, had a serum uric acid concentration on the third day after the accident of 8.1 mg but subsequent values were below 5.5 mg per 100 ml. These values are highly suggestive of radiation damage, but are of uncertain significance because the pre-exposure serum uric acid concentrations are not known. The serum bilirubin concentration was 1.7 mg on the third day, 1.6 mg on the fifth and 0.7 mg per 100 ml thereafter. Other tests of liver function were within normal limits.

Administrative Features

A serious nuclear accident generates enormous local interest and administrative problems not only because of the drama of the event but also because of the possibility of serious contamination by radiation, legal implications and special difficulties in management of this kind of patient. Fortunately, the accidents that have occurred to date have involved only 1 or a very few victims. One shudders to imagine the difficulties generated by an accident involving major exposure of several or more persons.

We were struck by the importance of establishing tight medical and administrative control at the earliest possible moment. One physician should be in full and acknowledged command of the medical care of the patient. Matters of radiation safety should be entirely in charge of the hospital radiation-safety officer (and every hospital within reach of a nuclear installation should have such a person on its staff). In addition, there should be an officer of the administration stationed at or near the point of entry to the area where he can govern access, handle procurement, inform relatives and the press and take care of the countless administrative details inevitably accompanying such an occurrence. A serious problem contributing to the confusion is the tendency of professional and other personnel to remain in the area long after their authentic duties have been discharged. The administrative officer should make it his business to keep the area free of all except those engaged in their legitimate duties. Also, ideally he would be in a position to handle and fend off as many telephone calls and other interruptions of the attending staff as possible. If these simple but necessary procedures are followed danger of contamination will be minimized, and care of the patient enhanced.

Summary and Conclusions

The rapid growth of the industrial use of nuclear energy imposes an inevitable risk of radiation accidents. The first fatal nuclear excursion in private industry is described here. The victim succumbed forty-nine hours after receiving between ten and twenty times the lethal dose of neutrons and gamma rays. The principal clinical problem was that of maintenance of the blood pressure and the competence of the heart. The myriad medical and administrative problems that arose are discussed.

The authors are indebted to Drs. Gordon Brownell and Roger Rydin, of the Physics Research Laboratory of the Massachusetts General Hospital, who carried out the gamma-ray spectroscopy and dose estimation, to Dr. M. Albala, of the Rhode Island Hospital, who performed the bone-marrow and other hematologic studies, to Drs. Thomas Forsythe and Stephen Frater and the house staff and nursing staff of the Rhode Island Hospital for their skillful and devoted help in the care of the patient and to Dr. Roman W. DeSanctis, who interpreted the electrocardiograms independently.

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FROM THE NOTE BOOK

RESEARCH ON THE TREATMENT OF LEUKEMIA

Methods for freeze-preserving and supplying human blood elements needed for treating leukemia will be developed under a research contract of the National Cancer Institute, National Institutes of Health, with the Massachusetts General Hospital in Boston. The contract has been awarded by the Public Health Service, Department of Health, Education, and Welfare for an initial one-year period in the amount of $70,750.

Dr. Charles E. Huggins, Director of the Cryobiology Laboratory at Massachusetts General Hospital and a pioneer in the development of techniques for preserving red blood cells by freezing, was named principal investigator on the newly awarded contract.

Transfusions of blood platelets effectively control hemorrhage, a frequent cause of death in leukemia, and transfusions of certain white cells help to enhance the patient's resistance to infection. However, no adequate method for preserving these blood elements has been devised to date.

When preservation methods have been perfected, Massachusetts General Hospital will supply frozen platelets and white cells to hospitals cooperating in the National Cancer Institute's nationwide leukemia therapy program. In addition, frozen blood elements from normal donors and acute leukemia patients will be made available for virus studies by scientists cooperating in the National Cancer Institute's virus-leukemia program.

Serving as the National Cancer Institute's project officer in the contract is Dr. Robert E. Stevenson, Chief of the Virology Research Resources Branch at the Institute. PHS, DHEW, July 14, 1965.

ESTROGENS DURING AND AFTER THE MENOPAUSE

Many recent reports in medical and lay publications have advocated the use of estrogens in all women during menopause and throughout the subsequent years, not only to control flushes and sweats and atrophic vaginitis, but also to protect against arteriosclerotic coronary disease, osteoporosis, the effects of aging on the skin and the breasts, and the psychological problems attributed to the menopause. In view of the paucity of long-term controlled trials, it is impossible to judge how valid some of these claims are.—The Medical Letter on Drugs and Therapeutics 7(14):54, July 2, 1965.

THE LVTP5A1 AND LITTER CARRYING KIT

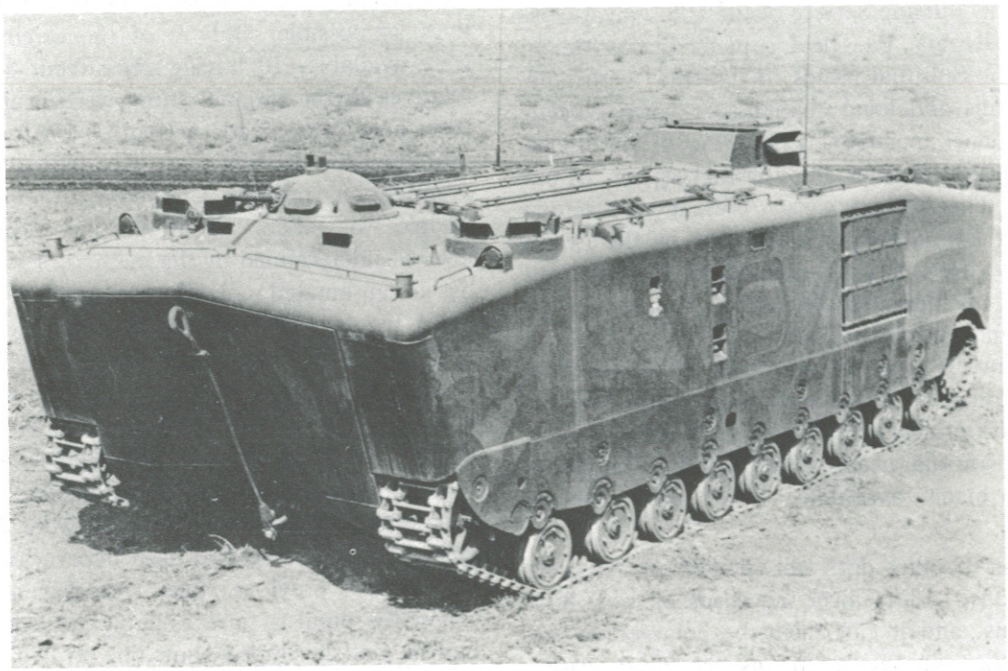
The amphibian vehicle LVTP5A1 (Landing Vehicle Tracked Personnel) is extremely useful when beach conditions preclude the use of landing craft. It can be employed to evacuate serious casualties from medical installations some distance inland and take them directly to medical facilities afloat. This eliminates the transfer of patients from vehicles to landing craft. Such ships as the LPD (Amphibious Trans-

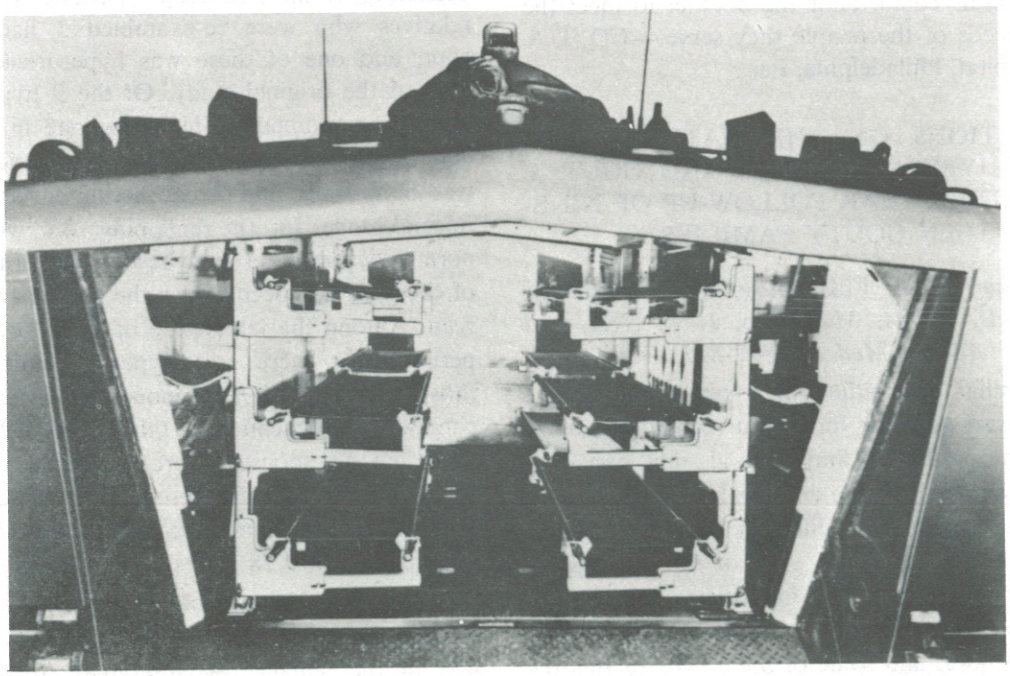
port Dock) can receive patients entering through the well deck.

The Marine Corps has 400 LVTP5A1 litter carrying kits. Each kit consists of stanchion assemblies capable of transporting 12 litters in the personnel compartment of the LVTP5A1.

The litter carrying kits are held in the Marine Corps Supply System as a Class IV item for issue on an as required basis. Each of the three active Amphibian Tractor Battalions have been authorized to hold 20 of the kits for peace-time use and training purposes. These 20 kits provide each battalion with a litter carrying capacity of 240 litter patients.

Litters are not provided with the litter carrying kits. Patients are strapped to the litters by means of a safety strap assembly which has a quick release. The LVT configuration permits removal of litters by either the bow ramp or through the overhead cargo hatches.





SPIRITUAL NEEDS OF PATIENTS

There are various crises which arise in the life of a sick patient which require understanding and specific action on the part of nursing personnel. Such crises include baptism of infants and last rites. The lack of understanding and knowledge of these customs by nursing personnel can cause dissatisfaction and even bitterness on the part of relatives or next of kin.

Therefore, as a part of the In Service Training Program, the Nursing Service of the U.S. Naval Hospital, Philadelphia, Pa., held a panel discussion on "Meeting the Spiritual Needs of Patients" with military chaplains and local civilian clergymen participating as panel members. The areas of discussion centered on the religious and spiritual aspects of patient care. The civilian clergy present represented the various denominations prevalent in the South Philadelphia area. Each explained the custom and practices of his individual denomination and stressed the importance of this program.

In an effort to continue that phase of total care of patients, a program has been instituted and a booklet prepared to further the understanding and knowledge of the spiritual needs of the patient. This information is made available to all new nursing personnel.

While this booklet does not include all religious denominations, it does meet the needs of most hospital patients, and it can easily be enlarged to encompass other denominations as the need arises. Other hospitals could tailor the booklet to meet the religious needs of the people they serve.—CO, U.S. Naval Hospital, Philadelphia, Pa.

OBSERVATIONS ON THE NATURAL HISTORY OF HYPERURICAEMIA AND GOUT. I. AN EIGHTEEN YEAR FOLLOW-UP OF NINETEEN GOUTY FAMILIES

M. T. Rakic, H. A. Valkenburg, R. T. Davidson, J. P. Engels, W. M. Mikkelsen, J. V. Neel, and I. F. Duff. Amer J Med 37, 862-871, Dec., 1964.

The familial distribution of hyperuricaemia and clinically overt gout has long been recognized and it has been suggested by Smyth et al. that hyperuricaemia is the result of the action of a single autosomal dominant gene with different degrees of penetrance in the two sexes. In view of the uncertainty regarding the mechanism of inheritance the families originally studied by Smyth et al. have been investigated once more, and some of the results of this review are presented in this paper from the University of Michigan.

Of the 19 families studied in 1938-42, 17 were reviewed in 1961-62. One of the 19 families was no longer available for study and a second family was excluded because the propositus was later found to be suffering from secondary gout; to replace these, 2 other families previously studied in 1946 were included in the series. As many as possible of the original subjects were re-examined, and the series was also extended to include as many other near relatives as possible. Only 9 of the original propositi were available, 10 having since died; 69 of the 99 relatives in the original study were available, 19 of them now being dead. A total of 193 relatives were examined for the first time. In addition to a clinical examination, usually conducted at home, a blood sample was taken. From this the serum uric acid level was determined by the method of Wolfson et al., by an automated colorimetric method, and sometimes by the enzymatic spectrophotometric method of Liddle et al. Of the relatives, 19 had to be excluded from this investigation because either salicylates or thiazide derivatives had been ingested shortly before the taking of the blood sample.

Among the 35 male relatives included in the original study 3 new cases of gout were found; only one of these persons had been hyperuricaemic at the time of the previous study. Another male relative originally found to have asymptomic hyperuricaemia had in fact developed gout, but he had died before beginning of the new study. Among the 34 female relatives who were re-examined 3 had developed gout, and one of these was hyperuricaemic at the time of the original study. Of the 9 hyperuricaemic males re-examined, 6, including one in whom gout had developed, had remained hyperuricaemic, one was borderline, and 2 had serum levels within the normal range. In the remaining 26 who had been normouricaemic, 11 had become hyperuricaemic, 6 of these having been under the age of 18 when first seen. Among the females, 6 of those previously hyperuricaemic were still hyperuricaemic and 8 of those who had been normouricaemic had now become hyperuricaemic. In this survey 193 relatives, including 41 spouses, were examined for the first time; overt gout was present in 7 (5 males and 2 females) and asymptomatic hyperuricaemia was demonstrated in 30 (18 males and 12 females).

Taking both groups of relatives together and including spouses, 9.3% of the males had gout and 4% of the females. Asymptomatic hyperuricaemia

occurred in 22.8% of the males and 15% of the females. A total of 17 patients known to have had gout died during the follow-up period. 10 from coronary heart disease and 4 from a cerebral vascular accident. The high mortality from this cause may have been partly due to the relatively high incidence of hypertension in these patients and their families (23% of first degree males and 39% of all female relatives had hypertension). The hypertension occurred with approximately equal frequency in the normouricaemic and hyperuricaemic relatives.

The results of this study agree with those of other similar investigations, suggesting an increased prevalence of gout and asymptomatic hyperuricaemia in the relatives of gouty patients, and also confirming that in male subjects hyperuricaemia tends to manifest itself after adolescence, but in female subjects not until after the menopause. An analysis of the data relating to the genetic problems is reserved for a future paper.

MEDICAL OFFICER TRAINING AID

Some medical officers have suggested that methods similar to the Audio-Digest are beneficial as an aid to Medical Officer Training and continued education. Medical training material documented on magnetic tapes on certain subjects has been very useful and interesting.

BuMed training funds are not available for this purpose, however, an individual medical officer may find it possible to request funds from his command or subscribe personally for this service. Further information may be provided upon request to the California Medical Association, 693 Sutter Street, San Francisco 94102.—BUMED, Code 316.

DENTAL SECTION

THE APICALLY REPOSITIONED FLAP—A CLINICAL STUDY

Donnenfeld, O. W., Marks, R. M., and Glickman, I. Jour Periodont 35(5): 15-20, 1964.

The apically repositioned flap is employed for achieving the objectives of mucogingival surgery without obtaining the undesirable side effects observed following earlier mucogingival extension procedures. A clinical experiment was conducted to evaluate the effectiveness of this procedure for pocket elimination, relocating frena, and increasing the width of the attached gingiva, and to determine whether this operation affected the location of the epithelial attachment and the height of the alveolar bone.

The findings indicate that the apically repositioned flap is effective for eliminating periodontal pockets, relocating frena, and establishing a significant increase in the width of the attached gingiva. The essential feature of these findings is that the retained portion of the gingival wall determines the extent to which the attached gingiva is increased. A slight additional increase occurs during the 1st postoperative week.

The increase in width of the attached gingiva was accompanied by a significant reduction in the alveolar bone height, which ranged from .5 mm. to 1.2 mm. with an average mean loss of .63 mm. This amount of bone loss may be of little consequence in patients with an intact periodontium, but it cannot be disregarded when bone support has also been reduced by periodontal disease.

The apically repositioned flap operation resulted in gingival recession which was manifested by an apical movement in the location of the epithelial attachment. The amount of recession was not significant, but the findings indicated a trend which, like the loss of alveolar bone, cannot be disregarded in the overall evaluation of the operation.

Bone loss and recession are undesirable side effects. They do not disqualify the operation as a useful therapeutic procedure. Their implication must be weighed against the benefits of the operation on an individual basis. (Submitted by: CAPT J. R. Conant, DC USN, U.S. Naval Station, Newport, Rhode Island.)

VENTRAL SURFACE OF THE TONGUE: AN EMERGENCY SITE OF INJECTION

Sklar, E., and Schwartz, M. Oral Surg, Oral Med, and Oral Path 19(1): 18-31, January 1965.

The authors studied the use of the tongue as a site for the administration of drugs in 15 animals. Using epinephrine as the test drug, the speed and duration

of the reaction was compared with intravenous and intramuscular sites.

The authors claim the injections made into the tongue have definite advantages to the dental practitioner in coping with office emergencies. "The technique offers (1) a definite advantage in the rate of absorption over intramuscular methods, (2) ease in placing the injection in the case of cardiovascular collapse with subsequent peripheral vascular collapse, (3) ease in placing the injection for those inexperienced in intravenous techniques, and (4) a definite advantage for the dentist, who is familiar with the anatomy of this region.

BONDING ALUMINUM TO ENAMEL WITH ULTRASONIC ENERGY

Hoffman, R. and Gross, L. Jour Den Res 44(2): 366-373, March-April 1965.

A bond between two dissimilar materials may be formed when they are brought into sufficiently intimate contact with each other. The ability to form such bonds and the strength of these bonds may be dependent on the physical and chemical nature of the materials. The ability to form a bond by the method described in this article is directly related to the transfer of ultrasonic vibratory energy to the bonding area.

In the experiments described, it was interesting to note that no alteration of tooth enamel in the neighboring surfaces was observed and hence it was deduced that local temperature rise did not reach excessive limits. This fact corresponds to data compiled in other work relating to the bonding of metal-to-metal by ultrasonic means.

In the quest for a better restorative material for the dental profession, the promise exhibited by the findings of the authors creates the possibility that a whole spectrum of materials may be bonded directly to hard biologic structures, i.e., enamel, dentine, cementum, or bone.

LINEAR STABILITY OF ELASTIC IMPRESSION MATERIALS

Hollenback, M., and Smith, D. D. Jour So Calif D A 33:32-36, January 1965.

Of the elastic impression materials used in dentistry, the polysulfides and silicones are superior to the hydrocolloids in linear stability. Probably the difference between these materials in linear stability is sufficient to affect their clinical application considerably.

Six reversible hydrocolloids, 5 polysulfides and 5 silicone materials were evaluated for linear stability.

All the hydrocolloids showed considerable linear instability (shrinkage). Therefore, any dies made from impressions using these materials will be oversize.

All of the silicone-base impression materials, when cured and poured at room temperature, showed minus values indicating that they all expand in setting. Dies made from these impressions would be undersize. When impressions were taken at 95° F. (mouth temperature), a high degree of stability resulted. Generally, dies made from such impressions would be slightly oversize, but perhaps this would have little clinical significance. The silicone base impression materials should be poured in 30 minutes or less. If allowed to stand over night before pouring, the impressions would be inaccurate.

The polysulfide-base impression materials behaved much as did the silicones. None of the polysulfides should be poured immediately; all impressions should be allowed to stand for at least 15 minutes before pouring. When the polysulfide is stored over night, the accuracy of the impressions is largely lost. The elastic limit of the polysulfide and silicone impression materials proved to be exceedingly high.

PERSONNEL AND PROFESSIONAL NOTES

International Association for Dental Research. The International Association for Dental Research held its 43rd General Meeting, 22-25 July, at Toronto, Canada. Symposia were held on Bioelectric Effects on Mineralized Tissues, and on Enamel Proteins. The International Society on Craniofacial Biology sponsored one evening's presentations in that field. Among a total of 462 research reports, 15 papers were presented on aspects of the U.S. Navy's intramural dental research program. In subsequent issues of the *U.S. Navy Medical News Letter,* it is planned to present abstracts of those reports, two per issue.

In order of presentation, these Navy reports were:

26. Balekjian, A. Y., Hoerman, K. C., Mancewicz, S. A. "The Kinetics of the Afterglow Process of Calcified Tissues at 89° Kelvin."
46. Shiller, W. R. "Periodontal Health of Submarine School Candidates: A Correlative Analysis."
49. Scola, F. P., Ostrom, C. A. "Clinical Evaluation of Stannous Fluoride in Naval Personnel."
53. Keene, H. J., Losee, F. L., Coykendall, A. L. "Observed and Expected Geographic Distribution of Caries-Resistant Naval Recruits."
54. Lamberts, B. L., Keene, H. J. "Parotid Saliva Amylase Activity in a Caries-Resistant Group of Naval Recruits."
55. Shklair, I. L., Keene, H. J. "An Evaluation of Caries Activity Tests in Caries-Resistant Naval Recruits."
97. Eden, G. T., Waterstrat, R. M. "Effect of Packing Pressure on Tensile Strength of Commercial and Spherical Dental Amalgams."
247. Keene, H. J. "Dental Anomalies Associated with Low Birth Weight."
281. Mancewicz, S. A., Hoerman, K. C., Balekjian, A. Y., Hefferren, J. J. "Luminescence of Enamel Treated with Stannous Salts."
286. Busch, H. M., Shklair, I. L. "Determination of Fluoride in Parotid Saliva in Caries-Resistant Naval Recruits."
291. Meyer, T. S., Lamberts, B. L. "A Comparison of Various Stains for Human Parotid Saliva Proteins Separated by Acrylamide Gel Electrophoresis."
297. Boyne, P. J., Yrastorza, J. "Osseous Repair of the Post-Extraction Alveolus in Man."
398. Quinn, J. P., Shklair, I. L. "A Relationship of Antibacterial Activity and the Total Solids Content of Parotid Saliva to Caries Development."
408. Cotton, W. R., Gorman, W. J., Lamb, J. R. "Pulp Response to Cavity Drying in Rat Teeth."
447. Hoerman, K. C., Mancewicz, S. A., Balekjian, A. Y. "A Suggestion that Collagen is a Third Class of Protein with Regard to its Low Temperature Luminescence."

U.S. Navy Dental Officer Presentations. CAPT Gordon H. Rovelstad DC USN, U.S. Naval Dental School, Bethesda, Maryland, served as Moderator, Scientific Section, discussing Fluid Environment of the Teeth, before the 3rd International Conference on Oral Biology, Royal College of Surgeons on 14-16 June 1965 in London, England.

CAPT P. C. Alexander DC USN, U.S. Naval Dental Clinic, Long Beach, California, presented a lecture entitled, "The Fallacy of the Cuspid Protected Occlusion," before the Naval Reserve Dental Company 11-3 on 27 May 1965 in Los Angeles, California. CAPT Alexander also presented a lecture entitled, "Periodontal Disease and its Relation to General Health," before the Staff of the Hawthorne Community Hospital on 4 June 1965 in Torrence, California.

CAPT N. B. Shipley DC USN, U.S. Naval Auxiliary Air Station, Meridian, Mississippi presented a table clinic entitled, "Autogenous Dental Transplants," before the Mississippi State Dental Convention on 21 June 1965 in Biloxi, Mississippi.

CAPT K. C. Hoerman DC USN, U.S. Naval Medical Research Institute, Bethesda, Maryland, participated in a Symposium on Dental Staining and Antimicrobial Therapy held at the Jefferson Medical College, Phila., Pa., 14-15 May 1965. The Conference dealt mainly with the staining effect of tetracycline following therapy during the period of formation of dental structures. CAPT Hoerman presented a paper intitled, "Osseous and Dental Luminescence Following *in vivo* Association of Tetracyclines with Calcium."

LCDR W. R. Cotton DC USN, U.S. Naval Medical Research Institute, Bethesda, Maryland, recently presented a lecture entitled, "Radiobiology in Dental Research" to the physics class of the Woodrow Wilson High School, Washington, D.C. The lecture was sponsored by the Visiting Scientists and Engineers Program under the auspices of the Joint Board of Science Education.

Navy Dental Corps Officers of the TWELFTH Naval District presented the following table clinics before the 95th Annual Scientific Meeting of the California Dental Association on 25-28 April 1965 in San Francisco, Calif.

CDR G. K. Woodworth DC USN, NAVSTA San Francisco, Calif.—Amalgam Splint.

CDR A. L. Davy DC USN, NAVSTA San Francisco, Calif.—Post-crown Technique.

LCDR W. D. Loo DC USN, NAVSTA San Francisco, Calif.—Tissue Conditioning for Immediate Dentures.

LCDR J. F. Hardin DC USN, NAVHOSP Oakland, Calif.—Mucogingival Surgery.

LCDR B. C. Terry DC USN, NAVHOSP Oakland, Calif.—Injection Obturation in Surgical Endodontics.

LT R. L. Seberg DC USN and LT D. S. Prock DC USN, NAVHOSP Oakland, Calif.—Combined Therapy in Treatment of Furcation Involved Teeth.

LT K. G. Ponder DC USN and LT J. M. Allen DC USN, NAVHOSP Oakland, Calif.—Resilient Denture Bases.

LT J. M. Cahan DC USN, NAVHOSP Oakland, Calif.—Surgical Flap Design.

LT B. E. Sharrow DC USN, NAVHOSP Oakland, Calif.—Suture Materials and Techniques.

LT R. W. Brazil DC USN and LT M. T. Jupina DC USNR, NAVHOSP Oakland, Calif.—Occlusal Equilibration.

LT R. E. Griffin DC USNR, NAS Alameda, Calif.—Medical Emergencies in the Dental Office.

The following dental officers of the THIRTEENTH Naval District presented table clinics as indicated before the 78th Annual Scientific Session of the Washington State Dental Association held 17-19 May 1965 in Seattle, Washington:

LCDR C. R. Jackson DC USN and LT D. L. Hearon DC USN, NAVSHIPYD Bremerton, Wash. —Retentive Pins for Large Restorations.

LT S. N. Anderson DC USNR and LT J. L. Burk DC USNR, NAS Whidbey Island, Wash.—Office Emergency Procedures for a General Practice.

Prosthetic Dental Item Returns to 6520 Group. Plastic Strip, Polyethylene, 4 by 4 inches, 200s: Transparent., former FSN 9330-720-3083 under the cognizance of DGSC has transferred to FSC 6520 as a medical item of supply. New FSN 6520-720-3083 will be under the cognizance of DPSC.

State Requires Fluoridation. Connecticut has become the first state in the nation to require fluoridation of the water supplies of all its major cities.

A bill passed by the legislature and signed May 28 by Governor John Dempsey requires that water supplies in cities with 50,000 or more population be fluoridated by January 1, 1967. In cities with populations from 20,000-50,000, the water must be fluoridated by October 1, 1967. These provisions will cover a majority of residents in the small, highly urbanized state.

The legislature's action ends a two-year-old dispute which began when the privately-owned New Haven Water Company successfully challenged ordinances by the city of New Haven and the nearby town of Hamden requiring fluoridation of water supplies.

A decision by Superior Court Judge Frank Covello adjudged the state as the logical authority, and the State Supreme Court upheld this ruling. (The AMA NEWS 8(25): 1, 14 June 1965.)

AN EFFECTIVE APPOINTMENT SYSTEM

CDR W. R. Hiatt, DC USN, has described a dental appointment system which he found highly effective on the USS BOXER from 1960-1962, and which is currently used at U.S. Naval Hospital, St. Albans.

Upon reporting for sick call, the patient is examined, and emergency treatment is rendered as required. A 3x5″ card is prepared, indicating the patient's name, dental classification, division, and tour completion or expiration of active obligated service date. The card is then placed last in a file of similar cards. The card prepared for dental class 4 is of a distinctive color to provide a ready reserve for prosthetic treatment.

Daily, cards from the front of the file are extracted in accordance with plans of the dental department. Dental Records, corresponding with the selected cards, are reviewed and appointments are established for the following day. Appointments for various individuals are verified with the appropriate division officers who in turn notify their personnel of the appointment. Individuals who are not available for the appointment are immediately revealed and their card is returned to the *front* of the file for a subsequent appointment. As each appointment is met, the card is returned to the rear of the file for rotation until treatment is completed.

As with any system this method was not infallible. An uncooperative division officer could provide a weak link in the chain. However, the problems were minimal and easily solved. The main advantage of this system, was the near total elimination of appointment failures. The usual response within the command was one of enthusiastic cooperation, because division officers were consulted one day prior to appointments rather than suddenly confronted with unexpected loss of personnel. Another advantage has been that appointments made only one day in advance were remembered, as compared to the tendency to forget an appointment made several weeks in advance.

HISTORICAL DENTAL SCHOOL RECEIVES NAVY ALUMNUS MEMENTO

RADM Frank M. Kyes, Assistant Chief of the Bureau of Medicine and Surgery (Dentistry) and Chief, Dental Division, presented a photograph and personal flag of the late Vice Admiral Alexander G. Lyle, to the University of Maryland School of Dentistry during ceremonies on 13 May 1965.

ADM Lyle, the first and only dental officer in the military services to attain three-star rank, was graduated from the Baltimore College of Dental Surgery in 1912. The school, established in 1840, was the first dental school in the nation. It later became the University of Maryland School of Dentistry.

ADM Lyle, who served as Chief of the U.S. Navy Dental Corps from 1945 to 1946, was awarded the Congressional Medal of Honor while serving with the United States Marine Corps in France during World War I.

AVIATION MEDICINE SECTION

NEW SCIENTIST ASTRONAUT

The National Aeronautics and Space Administration announced in July the names of the six (6) Scientist Astronauts. The only Navy selectee was LCDR Joseph P. Kerwin, MC USN, a designated Flight Surgeon Naval Aviator.

Doctor Kerwin entered the Navy Medical Corps in July 1958 after finishing his internship at D.C. General Hospital and was assigned to the Naval School of Aviation Medicine, Pensacola, Florida. After his designation as a Naval Flight Surgeon in January 1959 he was assigned to the Second Marine Air Wing, Marine Corps Air Station, Cherry Point, North Carolina, for duty. Following this two-year operational assignment, Doctor Kerwin was returned in February 1961 to Pensacola in the role of a Student Naval Aviator and received the "Outstanding Award" from the Training Command. He was designated a Naval Aviator in June 1962.

After designation, Doctor Kerwin was assigned to VF-101 at the Naval Air Station, Oceana, Virginia. In March 1963 he was transferred to Commander,

Readiness Attack Carrier Air Wing Four at the Naval Air Station, Cecil Field, Florida.

In view of the fact that Doctor Kerwin was already a qualified jet pilot, he required no further aviation training and commenced his astronaut training for the Apollo Program immediately.

Doctor Kerwin was promoted to the rank of Lieutenant Commander in the U.S. Navy Medical Corps in May 1963. He is married to the former Shirley A. Food of Dannville, Pennsylvania, and they have one child.—Aviation Medicine Section, BUMED.

DEDICATION OF THE NEW U.S. NAVAL SCHOOL OF AVIATION MEDICINE

Over 700 military and civilian dignitaries gathered at the U.S. Naval Air Station, Pensacola, Florida, on 14 May 1965, for the dedication of the new 3½ million dollar two-building complex of the U.S. Naval School of Aviation Medicine.

CAPT H. C. Hunley, MC USN, Commanding Officer of the Naval School of Aviation Medicine, welcomed those in attendance, and introduced the distinguished guests on the speaker's platform. These guests included: The Honorable Robert W. Morse, Assistant Secretary of the Navy for Research and Development; The Honorable Durward G. Hall (N. D.), Representative from Missouri; Vice Admiral A. S. Heyward, Jr., USN, Chief of Naval Air Training; Rear Admiral D. F. Smith, Jr., USN, Chief of Naval Air Basic Training; Rear Admiral J. L. Holland, MC USN, Commanding Officer of the U.S. Naval Aviation Medical Center; Rear Admiral H. H. Eighmy, MC USN, Assistant Chief of the Bureau of Medicine and Surgery for Personnel and Professional Operations; Rear Admiral Langdon C. Newman, MC USN, Assistant Chief of the Bureau of Medicine and Surgery for Research and Military Medical Specialties; Captain W. M. Snowden, MC USN, Assistant Chief of the Bureau of Medicine and Surgery for Aviation Medicine; and a host of others.

Vice Admiral Heyward spoke briefly and introduced The Honorable Robert W. Morse. Assistant Secretary Morse addressed the assemblage and he presented the Captain Robert Dexter Conrad Award for Scientific Achievement to Captain Ashton Graybiel, MC, USN.

Rear Admiral J. L. Holland, MC USN, Commanding Officer of the U.S. Naval Aviation Medical Center, introduced the principal speaker for the ceremonies, Rear Admiral H. H. Eighmy, MC USN, representing the Surgeon General.

In addressing the group Rear Admiral Eighmy said, in part, "We must maintain an institution like the U.S. Naval School of Aviation Medicine because the Navy, yes, even the world, needs an organized group of Aviation specialists such as those who serve here, whose primary concern is the adaptation of man in flight. This must be accomplished if man is to successfully operate aircraft that are constantly going faster and higher. Supersonic speeds and the conquest of space are no longer dreams—they are with us right now."—Aviation Medicine Section, BUMED.

NEW AVIATOR OXYGEN HELMET

The AOH-1 Helmet which represents a breakthrough in integration of several items of aviators' personal equipment is presently being evaluated in the fleet at Full Pressure Suit Training Units located at: U.S. Naval Air Station, North Island, San Diego, California, U.S. Marine Corps Air Station, El Toro (Santa Ana), California, U.S. Naval Air Station, Cecil Field, Florida, U.S. Naval Air Station, Norfolk, Virginia.

This evaluation is being conducted by the Station aviation physiologists to provide close monitoring for information feedback to the Navy's Aerospace Crew Equipment Laboratory, Naval Air Engineering Center, Philadelphia, Pennsylvania. This effort is a first in itself to provide experienced fleet evaluation teams for indoctrination and introduction of aviators' personal equipment.

The primary objective in the AOH-1 helmet design is to provide high retention reliability when subjected to high acceleration forces. Oxygen mask loss during ejection at high altitude and helmet displacement in high impact landings have resulted in serious or fatal injury. It also provides in one integrated assembly the functions of the current APH-6 helmet (oxygen mask, miniature oxygen regulator and communications). This helmet should improve peripheral vision by the elimination of the oxygen mask and suspension system. The weight of the AOH-1 helmet is less than the total weight of the APH-6 combined helmet assembly and offers improved comfort and mobility. The AOH-1 helmet incorporates a clear visor to enclose the breathing cavity and a tinted visor which is easily installed and detached and is intended to blow off during exposure to wind blast. The helmet provides for vertical and circumferential sizing and earcups that are adjustable fore, aft, and vertically. The helmet shell is split hinged at the top for easy donning and doffing and incorporates a locking device on each side to insure helmet reten-

tion. Exhaust air from the face or breathing compartment is ducted to flow over the head to provide ventilation. The oxygen regulator, incorporated in the helmet, maintains a pressure breathing schedule in accordance with conventional oxygen regulators. —Aviation Medicine Section, BUMED.

CAPTAIN ASHTON GRAYBIEL, MC USN, MAN OF SCIENCE

AEROSPACE MEDICINE is a rapidly developing science, an integral part of the U.S. Navy's vital assignment in the Space Age. And the U.S. Naval School of Aviation Medicine has its share of intellect and talent in this area.

One of the brilliant minds of the Navy medical research program, CAPT Ashton Graybiel, MC USN, again has been recognized for his contribution in original research. He recently brought home from New York the Arnold D. Tuttle Award, another accolade in his long list of internationally known and recognized achievements.

The Tuttle Award was given to CAPT Graybiel in recognition of his contributions in what is one of the most challenging problems in aerospace medicine —that of disorientation associated with functional disturbances having their origin in the semi-circular canal and otolith organs when man is exposed to the unusual force environments which may be encountered in aviation and space exploration. He has been a principal investigator in vestibular physiology for several years and has authored several articles in this field.

His many contributions in the Space Age reflect a deep dedication to science and research. His earlier work contributed to the prevention of accidents due to vertigo or disorientation by defining the specific types of vertigo in terms of physiological and psychological mechanism. His definition of factors and mechanism made possible measures to greatly reduce the hazards of aviation vertigo. More recent work has been concerned with the symptomatology and underlying mechanisms in different force environments, particularly subgravity states and constant rotation (coriolis force).

The Director of Research at the Naval School of Aviation Medicine, with degrees (cum laude) from the University of Southern California and Harvard Medical School, has been an aviation medicine scientist since World War II. He began his military career in 1942 and his contributions to the advance of aerospace medicine have been of great magnitude. His honors and awards, presented over the years, include two Aerospace Medical Association Awards, the Theodore C. Lyster Award in 1950 and the Eric Liljencrantz Award in 1961, and in 1963 he was awarded the Space Medicine Branch's Hubertus Strughold Award.

CAPT Graybiel is the type of dedicated scientist who keeps our space program moving rapidly. He is an inspiration to youngsters who wish to dedicate themselves to science and its wonderful adventures. —Aviation Medicine Section, BUMED.

FAA MEDICAL CERTIFICATION

The Federal Air Surgeon has brought to the attention of the Surgeon General that many medical certificates submitted by military flight surgeons are either incomplete or improperly issued.

It is directed that all flight surgeons conducting examinations leading to certification refer to BUMED Instruction 6120.11C of 23 August 1960 and the FAA Guide for Aviation Medical Examiners published September 1964. Copies of the latter are available by writing directly to the Chief, Aeromedical Certification Division, P. O. Box 1082, Oklahoma City, Oklahoma 73101.—Aviation Medicine Section, BUMED.

THE PERCEPTION OF ORIENTATION

Perhaps one of the most difficult concepts to get across to aircrew trainees, and especially the very inexperienced, is that of disorientation. It is, of course, reasonably easy to teach them a little elementary physiology, to demonstrate the upsetting of the vestibular system by use of the Barany chair, and even to demonstrate similar phenomena in flight, but this is only one aspect of the problem.

It has long been felt that teaching the complexity of this subject could be helped by the use of a suitable training aid, and to that end it was decided some time ago to attempt to produce a film. After many difficulties, such a film has at last been completed and is in process of being issued to those units most closely concerned with aeromedical training.

In this film the subject is presented through the medium of an informal lecture, and a number of interesting techniques are used to dramatize the presentation. The "lecture" is freely interspersed with illustrative examples, and interest in the material is well maintained.

The "lecturer" first describes the processes of perception as related to orientation, the correlation in the brain of the inputs from the body's sensors, and

the receipt of additional clues from aircraft instruments. After discussing disorientation produced by the conflict between human senses and aircraft instruments, he passes on to the failure of orientation. This is treated under the three broad headings of events not sensed, events falsely sensed, and events only imagined, and each heading is broken down in some detail. Following a discussion of the effects of disorientation, the film deals with the treatment and prevention of this condition.

It is one of the virtues of this film that it does not treat disorientation as a phenomenon experienced only by the pilots of fast, highly-maneuverable aircraft, but also gives emphasis to the problems experienced in larger aircraft, and the examples have been so devised as to include as many types of aircraft as possible.

This is not the first film on disorientation to be produced, and we already use the USAF film "Spatial Disorientation in Flight" (ref 14C/3448). However this is a short film (16 minutes), which covers many of the individual physiological mechanisms of vision and balance, but fails to discuss disorientation in its wider aspects. On the other hand, "The Perception of Orientation" spends little time on the subjects covered in the USAF film. Each covers subjects largely omitted by the other, and the two films combine to make a very comprehensive treatment of the subject.

"The Perception of Orientation" has been given RCAF catalogue number 14C/4086. It lasts for 37 minutes, and can therefore be combined with "Spatial Disorientation in Flight" so that the two have a total remaining time of 53 minutes, which should allow them to be shown successively in one lecture period.—Aeromedical Reports p 26-27, 1965.

STAFF MEMBER PARTICIPATES IN 34-DAY SPACECRAFT FLIGHT

LT L. J. Jenkins, MSC USNR, Nutritional Biochemistry Division, participated in a simulated space flight conducted at the Naval Air Engineering Centers Aerospace Crew Equipment Laboratory, Philadelphia, Pa. Blood studies were made on the subjects by LT Jenkins, assisted by Chief Hospital Corpsman B. G. Kester, for the possibility of damage due to the breathing of pure oxygen at five pounds per square inch absolute, the equivalent pressure of an altitude of 27,000 feet, for a period of three weeks. No striking changes were observed in this evaluation of the proposed atmosphere for future Apollo Spacecraft flights.—NMRI Notes, No. 5—May 1965.

EJECTION OCCURRENCES AND RELATED FATALITIES

By LT W. L. Smith, MSC, USNR

On a yearly, recurrent basis, ejection seat statistics are reviewed by the U.S. Naval Aviation Safety Center, Norfolk, Virginia, and cognizant codes in the Naval Weapons Support Activity (Bureau of Naval Weapons), and the Bureau of Medicine and Surgery. This review is made in an effort to establish possible problem areas which may be reduced or eliminated by either engineering changes or shifted training emphasis.

Questions that might logically be asked of ejection statistics are: At what altitudes do the highest fatality rates occur?; At what altitudes do the largest number of ejections occur?; At what air speeds do fatalities occur?

Some of the above questions can be answered by analysis of ejections by basic statistical inference, if such inference is applied with the complexity of ejection occurrences kept in mind. Many items that are reported in ejections may be best-judgment estimates and no more than that.

CY 1964 Ejection Statistics (Known)

Percentage of ejects vs. altitude

In discussion throughout this article, the word "known" will denote the use of data in which either the air speed or altitude is known at the time of ejection.

Although it is difficult to use just one calendar year's data for analysis, a brief analysis will be made of CY 1964. This analysis will then be utilized to refer to a larger body of accumulated data, the ejection statistics for CY 1949-1964.

In Table 1 it can be seen that from altitude 0 to 4,999 feet of altitude a total 65 per cent of our ejections occur. It also indicates where highest percentage of fatalities occurred. From 0 to 499 feet there was 50 per cent fatality rate. Of course this fatality rate includes some ejections in which the ejection was not initiated within the envelope of the seat design. However, such facts do re-emphasize the need for low-level escape systems.

If we increase our altitude increment from 0 to 9,999 feet, we find 87 per cent of the ejections are in this region.

DATA TABLE 1

CY 1964

Altitude	Per cent Occurring/ Total Ejections	Per cent Fatal/ Altitude Increment
0 - 499 ft.	23	50
500 - 999 ft.	10	14
1,000 - 1,999 M	9	8
2,000 - 2,999 M	8	0
3,000 - 4,999 M	15	5
5,000 - 9,999 M	22	0
10,000 - 19,999 M	8	8
20,000 - 29,999 M	4	0
30,000 - 39,999 M	1	0
40,000 M & above	No occurrence	

Where in terms of altitude, do 99 per cent of our ejections take place? From 0-29,999 feet of altitude 99 percent of our ejections take place with the remaining one per cent found in the altitude increment of 30,000-39,999 feet.

Percentage of ejects vs. air speed

The air speed increment from 0 to 249 KIAS (estimated) represents 69 per cent of our ejections during the CY 1964. Such a distribution might be expected due to the increased effort in improving low level escape systems capability and the subsequent utilization of that state capability.

Data Table 2 also shows the fact that most of our ejections occur at below 400 KIAS (estimated). The hazards imposed upon an ejectee in an open ejection seat, at around and above this speed, are serious in terms of windblast and ram pressure effect. To minimize this hazard, aircrew personnel are encouraged to eject at lower speeds if the emergency situation will allow such action to be accomplished. As can be seen from Data Table 2, 97 per cent of our ejections occur between 0 and 399 KIAS (estimated).

Between 0 and 99 KIAS (estimated), the highest relative fatality percentage occurs. This fact is remarkable in that there are only two systems which have recommended ejection initiation at speeds below 99 KIAS on the deck. As can be pointed out at this time, there are many successful ejections that occur completely out of their design envelope.

CY 1949-1964 Ejection Statistics (Known)

Percentage of ejects vs. altitude

In comparing similar altitude increments which were referenced in the CY 1964 data, we find in Data Table 3 for CY 1949-1964, the percentage of ejections that occurred between 0 and 4,999 feet is 44 per cent. The difference between CY 1964 (50 per cent) and CY 1949-1964 (44 per cent) data illustrates the trend towards utilization of low level escape capability.

Increasing the altitude increment to encompass 0 to 9,999 feet provides a contrast of 75 per cent (CY 1949-1964) versus 87 per cent (CY 1964) for ejections. Again the lower altitude for initiation of ejection is indicated.

In looking at accumulated ejection statistics it should be noted that 98 per cent of our ejections occur below 30,000 feet of altitude. For CY 1964 in this same altitude increment, 99 per cent of ejections occurred.

Percentage of ejects vs. air speed

Data Table 4 shows that from 0 to 249 KIAS (estimated) 68 per cent of our ejections are in this

DATA TABLE 2

CY 1964

Airspeed	Per cent Occurrence Total Ejections	Per cent Fatal/ Air Speed Increment
0 - 99	6	44
100 - 149	19	11
150 - 199	22	19
200 - 249	22	13
250 - 299	13	11
300 - 349	10	7
350 - 399	5	0
400 - 449	1	25
450 - 499	2	0
500 - 549	No occurrence	
550 - 599	No occurrence	
600 - 649	No occurrence	

DATA TABLE 3

CY 1949-1964

Altitude	Per cent Occurrence Total Ejections	Per cent Fatal/ Altitude Increment
0 - 499 ft.	16	47
500 - 999 ft.	6	27
1 - 1,999 M	10	15
2 - 2,999 M	6	9
3 - 4,999 M	12	7
5 - 9,999 M	25	4
10 - 19,999 M	18	6
20 - 29,999 M	5	4
30 - 39,999 M	2	5
40 M & above	(Insignificant 1/1252 cases)	

air speed range. This occurrence figure is in close agreement with the CY 1964 data of 69 per cent.

At air speed below 400 KIAS (estimated), CY 1949-1964 data demonstrates the fact that ejections are now occurring at lower speeds. CY 1949-1964 data had an accumulated percentage of 92 per cent versus CY 1964's 97 per cent occurrence.

Fatality rates in the accumulated data are much lower in terms of percentage illustrating the danger of looking at any one year in usage evaluation of competitive escape systems. For CY 1949-1964, at 0-99 KIAS (estimated), there was a fatality rate of 28 per cent versus 44 per cent for CY 1964. Such utilization of accumulated data augments evaluation of current ejection statistics by showing possible skewing which is significant to one year only.

Reduction of Fatality Rates

Aircrew personnel survival is paramount in the interests of Aviation Medicine. Bureau of Medicine and Surgery liaison personnel with Naval Weapons Support Activity are involved with coordination of ejection seat specifications and developmental requirements with respect to physiological and biophysical requirements. Furthermore, steps for increased or shifting emphasis in Aviation Physiology Training Units' ejection training is performed by the Aviation Physiology Training Branch. Such steps as outlined above provide for long term as well as immediate response in order to reduce ejection fatalities.

Human error in judgment for recognizing a situation which is beyond recovery possibilities still happens. It is hoped that through re-emphasis in training that human error can be minimized or maintained at the lowest level possible.

In summary, reduction of fatalities in ejections will be accomplished through increased training, research, development, test and evaluation efforts. —Aviation Medicine Section, BUMED.

DATA TABLE 4

CY 1949-1964

Air Speed (KIAS)	Per Cent Occurrence Total Ejects	Per cent Fatal/ Air Speed Increment
0 - 99	3	28
100 - 149	15	16
150 - 199	28	10
200 - 249	22	10
250 - 299	12	10
300 - 349	8	13
350 - 399	4	6
400 - 449	3	16
450 - 499	2	33
500 - 549	2	32
550 - 599	Less than 1% 2/1167 cases	50
600 - 649	3/1167 cases	67

NEW DEVELOPMENTS IN THE NAVAL AVIATORS FULL PRESSURE SUIT (SPACE SUIT)

The Navy MK–IV full pressure suit has been in operational use in high performance military aircraft for approximately seven years. A modification of the MK–IV design was used in all the NASA Project Mercury space flights with outstanding success. During the past four years, research and development has continued on an expedited basis at the Navy Aerospace Crew Equipment Laboratory with contractor assistance. Currently, a prototype full pressure or space suit called the X49 has been fabricated which incorporates outstanding improvements compared to the operational MK–IV suit. Certain of the functional designs associated with the X49 suit have been incorporated into the project Gemini space suit. Major break-through concepts in the new X49 suit include, but are not limited to, those associated with rapid self-donning and doffing, maximum ventilation system and cooling efficiency, protection from adverse low or high temperature conditions while in the cockpit or during survival on the ground or in the water, and mobility when the suit is pressurized. This mobility is such that all controls and emergency escape devices in the aircraft can be easily operated. The suit provides outstanding protection from low ambient pressures above 35,000 feet.

The donning time of the X49 suit is 3 minutes without assistance, compared with 10 to 15 minutes with aid for its predecessor. Doffing time is 1½ minutes without aid, compared to 10 minutes for the MK–IV. It provides adequate thermal protection throughout a temperature range of −40° to + 150° F. It incorporates ventilation from the soles of the feet to the crown of the helmet. The suit is self-sizing. All maintenance can be conducted at squadron level.

The major improvement associated with the newly designed garment is that associated with mobility. The rotating neck ring and shoulder arrangement permit effortless bending regardless of pressure differentials. The helmet is manufactured of fiberglass, contains a foam energy absorption material, and a webbing suspension system for head retention. The suit is compatible with all current Navy high altitude aircraft as well as the new FI11-B aircraft. —Aviation Medicine Section, BUMED.

FIRST FLASHBLINDNESS TRAINER DELIVERED

The First Navy Flashblindness Trainer developed under contract with Biotechnology, Inc., Arlington, Virginia is to be delivered in the month of July 1965 to the U.S. Marine Corps Air Station, Beaufort, South Carolina. This device will be utilized to indoctrinate aircrew personnel in the hazards of flashblindness from nuclear weapons events and to demonstrate the protection afforded by aircrew personnel flashblindness protective gear. The trainer measures the period of flashblindness through the presentation of an altitude-hold task or a digital readout display task.—Aviation Medicine Section, BUMED.

RESERVE SECTION

MEDICAL UNIT IS COMMENDED FOR "GITMO" HOSPITAL TOUR

By Read Wynn, LCDR, USNR

WASHINGTON—A 15-man cadre of medical personnel from one of the U.S. Navy's most unique Reserve Surface Divisions has won for each member a Letter of Commendation for duties "performed in an outstanding manner both as individuals and as members of our hospital staff" from the commanding officer of the U.S. Naval Hospital at isolated Guantanamo Bay, Cuba.

CAPT Herbert A. Markowitz, ranking doctor on the historic U.S. Naval Base at Fidel Castro's "bamboo curtain" gateway to Communist Cuba, presented each of the Washington area doctors, Reserve Medical Service Corps specialists, and enlisted hospital reservists a "hearty 'Well Done' " just before they returned here last week (April 29) from a ten-day, on-the-job active duty period.

The Surface Division is a distinctive one in Navy annals in that all but three of its 65 members are medical and hospital specialists. Most of them are

engaged in general (more) or specialized practice in private life.

The division is headed by a wartime ship commander, now Dr. Charles J. Savarese, Jr. of Kennsington, Md. He is a commander, Medical Corps, U.S. Naval Reserve, and has been the Reserve division's commanding officer since July, 1961. Originally formed as a Hospital Corps Division of 23 members in 1959, the unit was so high in Naval Reserve achievement that it was the only one of 20 such hospital units allowed to remain intact when the Navy disestablished them throughout the country and interspersed their members to surface divisions.

Dr. Savarese is an eminent Montgomery County, Md., cardiologist and general practitioner, with a number of national celebrities on his list of regular patients. He was recently named assistant clinical professor of medicine at George Washington University Hospital among other medical service honors and achievements he already holds. He is 45, married, with three children.

The Reserve division's executive officer is Clarence J. Gibbs, Jr., A. B. (biology), M. S. (zoology), Ph.D. (microbiology). He is a lieutenant commander, Medical Service Corps, USNR; 40 years old, a bachelor and National Institutes of Health researcher in viruses.

The Navy's Reserve Division 5–43(S) boasts an array of talent; among the young doctors is 32-year-old Thomas F. Flaherty of Bethesda, who is formerly a Marine Corps Reserve officer now a lieutenant, Navy Medical Corps, USNR. He is a resident obstetrician at Georgetown University Hospital, D.C.

The tour of duty at Guantanamo Bay proved an eye-opener for many of the younger hospital corpsmen of the division. One, the only Negro on the "cruise," assisted in 11 operations at the Naval Hospital. He is Joseph Keill Petway, Jr., of Washington. He is 24 with an enviable background of hospital training and performance. He has attended one year of Medical School at Howard University and hopes to return; if that is delayed, Petway reports, he is aiming for the Navy's Officer Candidate School —with his B.S. in zoology from Howard University, Washington.

At the Naval Hospital, Cuba, each member of the group from Washington was assigned an "opposite number" from regular hospital personnel to assist and guide them through a rigorous program of part duty, part training.

The Gitmo hospital skipper, they learned, was a POW at Guam in the Pacific until the end of World War II. They also learned that CAPT Markowitz is an indefatigable orthopedic surgeon and a "working CO."

EDITORIAL DESK

LEGION OF MERIT PRESENTED TO NORFOLK NAVAL DOCTOR

Norfolk, Va—CAPT Rosario A. Fisichella, Force Medical Officer of Service Force, U.S. Atlantic Fleet, has been awarded the Legion of Merit for his services in South Vietnam.

The Navy doctor was presented the high military award on June 23 by RADM John W. Ailes, III, on behalf of the Secretary of the Navy.

CAPT Fisichella was Senior Medical Officer, Headquarters Support Activity in Saigon from February 1964 to February 1965.

In that position he was head of a 100-bed hospital which cared for casualties in the southern Vietnam battle area. This is the only Navy hospital that takes casualties directly from the field.

The citation that accompanied the medal states that "Captain Fisichella, through his superb leadership, dedication, and efficiency, created new concepts of service and succeeded in giving prompt and effective medical treatment to all those in need."

The citation continues to commend the captain for his successful solutions to the many complex and frustrating problems encountered in establishing the medical operations.

It was during his tour of duty that the build up of American military forces caused an increased load to existing medical facilities. The installation also provided medical treatment to hundreds of civilians supporting the war against Communist insurgents.

LEGION OF MERIT AWARDED—CAPT Rosario A. Fisichella, Force Medical Officer of Service Force, U.S. Atlantic Fleet, is congratulated by Rear Admiral John W. Ailes, III, force commander, upon being awarded the Legion of Merit medal. Looking on are his wife Melba and members of command's staff. (Official U.S. Navy Photo by PH2 Bybee.)

The doctor also received the Joint Services Commendation medal on June 16 for his duties as Joint Task Force Surgeon at the outbreak of the Dominican Republic crisis. At that time he was senior medical officer in the Caribbean operations.

CAPT and Mrs. Fisichella live at 427 Powhattan St., Norfolk Naval Station.

CDR TIDWELL RECEIVES THE NURSING EDUCATION AWARD

CDR Dorothy C. Tidwell, NC USN was honored by the University of Washington, Seattle recently by being selected as the most outstanding student completing the Graduate Program.

CDR Tidwell was assigned to the University of Washington to pursue graduate education in Nursing Service Administration and graduated with a masters degree in nursing in June 1965.

As a naval officer she has served in a variety of assignments including duty at Aiea Heights, Hawaii during World War II and aboard the hospital ship USS Repose during the Korean conflict. She is now the Assistant Chief of Nursing Service at the U.S. Naval Hospital, Camp Pendleton, California.—Nursing Division, BUMED.

ACKNOWLEDGEMENT

Additional information received indicates that the first Newport Naval Hospital constructed in 1896 was built on Coaster's Harbor Island some distance from the present hospital site. This was a frame building which was closed in 1913 when the present hospital was commissioned.

The present Naval Hospital is located on the Mainland of Aquidneck Island (not Coaster's Harbor Island).

The U.S. Navy Medical News Letter 45(11) should include the above information on the historical sketch of the hospital.—Editor.

LEADERSHIP—AN ADJUDICATOR OR INNOVATOR

A supervisor's role as a leader is largely shaped by his personal commitment to a set of principles

embodied in a philosophy of management—a philosophy that may have been learned from former supervisors, fellow supervisors, or fostered by the very climate of the organization itself. The importance both the supervisor and the organization attach to a philosophy of management determines the effectiveness of his efforts at leadership.

A supervisor sometimes chooses between two broad philosophies of management. Adhering to one, he views his role as a passive one. He is a judge to whom his subordinates submit recommendations as a part of their "completed staff work" for his approval or disapproval. In this role too often the leader becomes a fine mesh screen through which passes only the safe and noncontroversial. Assuredly, there is a need for the review function of supervision and the leader must exercise this responsibility when appropriate. But if his personal commitment to the habits of the adjudicators is over-riding, or if he has no emotional resiliency to organizational pressures, an essential ingredient of leadership is lost. That ingredient is innovation.

On the other hand, he could choose the leadership philosophy of activism. Marked by a progressive attitude, coupled with an urgency of purpose, aggressive leadership of the innovator develops programs, defines objectives, initiates advancement, and motivates subordinates. Optimism, enthusiasm, initiative, action, and constructive thinking characterize the attitude of the innovator who regards each task as an opportunity for finding solutions to today's problems today.

Secretary of Defense Robert S. McNamara expressed his thought along this line when he wrote in the April–June 1964 issue of the Civil Service Journal that as Secretary ". . . he could play an essentially passive role—a judicial role." Instead he chose to play the active role, which represents his own philosophy of management, ". . . providing aggressive leadership—questioning, suggesting alternatives, proposing objectives, and stimulating progress."

Making the further point that there is much room for decision-making at all levels within DOD, Secretary McNamara added "I strongly believe in the pyramid nature of decision-making and that, within that frame, decision-making should be pushed to the lowest level in the organization that has the ability and information available to apply approved policy. The defense effort is entirely too big, too complex, and too geographically dispersed for its operations to be managed from a single control point." It is not necessary to recite the many programs and problems facing the Navy that require the dedication at each level of the innovator—the progressive manager.

Quality leadership at the top is not enough. An equality of quality throughout the organization is even more of a necessity. Writing in a recent Harvard Business Review, Mr. Harold Wolff, in commenting on the success of General Motors stated: "No matter how brilliantly the objectives of the company are received or how brightly they are communicated throughout the organization, if the decision-making process . . . is not at least equal in excellence, what starts out as a clear enough objective can be dissipated and diffused in a myriad of half-hearted and even conflicting activities."

As a manager, have you adopted as your sole philosophy the half-hearted decision-making technique of the adjudicator? Or have you accepted the active leadership role of a progressive innovator pitting your best talents against the tasks at hand?—OIR Newsletter XVI(6): 3, June 1965.

NAVY CORPSMAN HONORED FOR LIFE-SAVING ACTION

Saigon (AFPS)—Navy Hospital Corpsman First Class Lloyd J. Barbarin has received the Navy Commendation Medal for saving the life of a naval officer wounded in the March 30 Viet Cong bombing of the U.S. embassy.

Barbarin was cited for giving aid to a Navy officer whose carotid artery, in the neck area, had been severed. Barbarin held the two severed ends until surgeons could take over. The officer is now on the road to recovery.

The medal was presented to Barbarin by CAPT Archie C. Kuntze, commanding officer of U.S. Navy Headquarters Support Activity, Saigon, at a formal awards ceremony.

USN HOSPITAL STAFF PRAISED BY AMB. TAYLOR

Saigon (AFPS)—Former U.S. Ambassador to the Republic of Viet-Nam Maxwell D. Taylor has praised personnel of the U.S. Navy hospital here, for work in treating casualties which occurred during the Viet Cong bombing of the My Canh floating restaurant.

His message cited the rapid, skilled treatment of wounded at the devastated restaurant and tireless efforts of operating and emergency room staffs which saved many lives.

NAVY DOCTOR TREATS RVN CIVILIANS

SAY AHHHHH—Lieutenant James J. Zelko, MC, USN, examines a small child at a battalion aid station in the Le My complex near Da Nang, Republic of Viet-Nam. The aid station was established by the Second Battalion, Third Marine Regiment.

SELF-MEDICATION

Trenton, N.J. . . . (NAVNEWS) . . . . There is an old adage in medicine that "a doctor who prescribes for himself has a fool for a patient." If this is true, how much more a fool is the average layman who indulges in self-medication.

For some reason, all mankind deems it an inherent right to take medicine on his own initiative. Up until recent years such self-medication led to very little harm, since most concoctions consisted of various types of herbs with little or no pharmacological action. However, the advent of synthetic preparations such as analgestics, sedatives, and more recently antihistamines and other potent amines, have placed in the hands of the laymen many potent (and at times toxic) substances for self-medication. In a recent address to the American Pharmaceutical Association, Dale G. Friend, M.D., presented a paper entitled "Everyone should be concerned with Drug Safety." He pointed out that unquestionably there is far more self-medication now than ever existed in our grandparents' day and as a consequence, with the potent agents now available, a great deal more toxicity is also occurring.

Many physicians see patients who get skin reactions, abnormal heart action, over-sedation, and at times mental excitement from taking many of the commonly used "painkillers," anticold preparations, and numerous other over-the-counter remedies. Formerly, when these agents were sold in the pharmacy only, the pharmacist who knew drug action (and often knew those who procured drugs from him) was able to warn the individual. This safety control unfortunately was lost when many of these over-the-counter preparations were placed in supermarkets, restaurants and other places where individuals could purchase them without any possibility of receiving expert advice.

The other danger in self-medication is that the real diagnosis of disease is delayed, the symptoms are masked until serious progression has taken place, which may lead to the individual losing his life.

Be wise-if you are ill enough to require medication, visit your sickbay. (By CAPT Tracy D. Cuttle, MC USN.)

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